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THE

JOURNAL OF CONCHOLOGY:

BEING THE ORGAN OF THE

CONCHOLOGICAL SOCIETY

OF GREAT BRITAIN AND IRELAND.

EDITED, UNDER THE DIRECTION OF THE COUNCIL,

BY

J. R. LE B. TOMLIN, M.A., F.E.S.

VOL. XV.

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* * *

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THE
JOURNAL OF CONCHOLOGY.

VOL. 15. JANUARY, 1916. No. 1.

CONSTITUTION OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND.

1.—This Society shall be called "**The Conchological Society of Great Britain and Ireland.**"

2.—Its object shall be the promotion of the science of Conchology, by the holding of Meetings for the reading and discussion of original papers, by the publication of Proceedings, and by the formation of a Library and Collections illustrative of the science.

3.—It shall consist of Ordinary and Honorary Members.

4.—Ordinary Members shall be proposed by two Members at one meeting, and balloted for at the next. They shall pay, in advance, on the 1st January in each year, a subscription of 5/-, or may compound for life by the payment of Three Guineas. If on December 31st of any year a member shall be three or more years in arrear with his or her subscription, the Council shall erase his or her name from the list of members, and shall take whatever steps seem desirable for recovery of the arrears. The Council shall further report the erasure of such names to the next meeting of the Society with a view to their publication in the Journal.

5.—Composition Fees shall be invested in Books, Cabinets, or other permanent property, or in such other manner as the Council may think most conducive to the benefit of the Society.

6.—The number of Honorary Members shall be limited to ten, and they shall be exempt from all payments and have the privileges of Ordinary Members.

7.—It shall be governed by a Council, consisting of a President, two elected Vice-Presidents, a Treasurer, a Secretary, a Curator, a Recorder, a Librarian, an Editor, and six other members, who shall be elected annually by ballot; the voting paper issued to be returned to the Secretary, under cover of sealed envelope, addressed to the Scrutineers. Any two of the following offices may be held by one person, viz. :—Treasurer, Secretary, Curator, Recorder, Librarian, and Editor. The President and Secretary of the Leeds and London Branches and such other branches as may afterwards be accepted at an annual meeting shall, *ex officio*, also be members of the Council of the Society.

8.—The Presidency shall not be tenable for more than one year at a time, and the President is expected to give an address. On the conclusion of his term of office, he shall become an *ex officio* Vice-President of the Society and an *ex officio* Member of the Council.

9.—The meetings shall be held monthly, at the time and place fixed by the Council, who shall also have power to arrange such additional meetings as they may think desirable.

10.—Three shall be a quorum at all meetings.

11.—The Annual Meeting shall be held at such time and place as may be fixed at the previous Annual Meeting, to receive the Reports and Balance Sheet of the out-going Council, and to elect a Council and Officers for the ensuing year.

12.—The accounts, before being presented, shall be audited by two members appointed at a previous meeting.

13.—The Proceedings shall be published periodically, under the direction of the Council.

14.—The Capital and Property shall be vested in two Trustees, elected by the Society.

15.—No alterations in the rules shall be made, unless by a majority of three-fourths of the members present at a meeting which has been specially summoned.

The **Annual Subscription** is **Five Shillings**, due on the 1st January in each year.

◆

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Corrected to Dec. 26th, 1915.

(With year of election; O = founder, or original member; L = Life Member; P = has filled the office of President *post packets have been returned undelivered).

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1880. *P* Melvill, James Cosmo, M.A., D.Sc., F.L.S., Meole Brace Hall, Shrewsbury.
1904. Milne, James N., Foylemore, St. Jude's Avenue, Belfast.
1906. Monterosato, Il Marchese di, 2, Via Gregorio Ugdalena, Palermo, Sicily.
1910. Moorcock, J., 91, Broadfield Road, Catford, S.E.
1902. *L* Moore, Chas. H., 103, Mottram Road, Stalybridge.
1908. Moore, Albert J., 9, Brook Street, Hull.
1907. Morey, Frank, F.L.S., Wolverton, Carisbrooke Rd., Newport, Isle of Wight.
1912. Murdoch, G. H., 49, Parliament Hill, Hampstead, N.W.
1906. Murdoch, R., Wanganui, New Zealand.
1907. Musham, J. F., F.E.S., Haylands, Brook Street, Selby, Yorks.

1905. * Napier, H. C., 15, The Common, Woolwich.
1911. Nash, Rev. E. H., M.A., Wetley Rocks Vicarage, Stoke-on-Trent.
1903. Nash, P. B., Bruce Mines, Algona, Ont., Canada.
1891. *P* Newton, Richard Bullen, F.G.S., 11, Twyford Crescent, Acton Hill,
London, W.
1891. *P* Norman, Rev. Canon Alfred Merle, D.C.L., F.R.S., etc., The Red
House, Berkhamsted.
1901. Norton, Miss E. M., 20, Eastfield Road, Westbury-on-Trym, near Bristol.
1915. Norwood, Mrs. Gilbert, 4, *The Glen*, Saundersfoot, Pembrokeshire.

1887. Oldham, Charles, The Bollin, Shrublands Road, Berkhamsted.
1910. Oliver, A. M., West Jesmond Villa, Newcastle-on-Tyne.
1896. Overton, Harry, The Newlands, Boswell Road, Sutton Coldfield.
1905. *L* Owston, Alan, Yokohama, Japan.

1904. Parritt, H. W., 14, Stanhope Gardens, Highgate, N.
1902. Pattison, Ernest, 52, Saxe Coburg Street, Leicester.
1886. Pearce, Rev. S. Spencer. M.A., Long Combe Vicarage, near Woodstock, Oxfordshire.
1913. * Pellow, N. E., 432, Stratford Road, Sparkhill, Birmingham.
1901. Penrose, G., Royal Institution of Cornwall, Truro.
1907. Petty, S. L., Dykelands, Ulverston, Lancs.
1908. Phillips, R. A., Ashburton, Cork.
1913. Pickard, Bertram, Tregenna, Mansfield.
1904. Platt, Thos. H., Harpurhey Mill, Rochdale Road, Manchester.
1886. Ponsonby, John H., F.Z.S., 15, Chesham Place, London, S.W.
1913. Presbrey, E. W., 17, Trinity Place, New Rochelle, N.Y., U.S.A.
1897. Preston, Hugh Berthon, F.Z.S., 52, Longridge Road, London, S.W.
1907. Priske, R. A. R., 9, Melbourne Avenue, West Ealing, Middlesex.
1906. *L* Pritchard, G. B., F.G.S., 38, Mantell Street, Moonee Ponds, Victoria.

1906. *L* Radley, Percy E., F.R.M.S., 30, Foxgrove Road, Beckenham, Kent.
1899. Ramanan, Vedaraniam Venkata, M.A., F.Z.S., 12, Sami Pilla Street, Triplicane, Madras, S. India.
1906. Reynell, Alexander, Brackley, Crofton Lane, Orpington, Kent.
1905. Reynolds, Laurence R., 233, Aspinwall Avenue, Brookline, Mass., U.S.A.
1913. Rhodes, F., 113, Heaton Road, Manningham, Bradford, Yorks.
1900. Richards, C. P., Mission House, Stenalees, St. Austell, Cornwall.
1906. * Ritchie, John, jr., Box 2795, Boston, Mass., U.S.A.
1898. Roberts, A. William Rymer, The Common, Windermere.
1913. Roberts, J. W., 145, Withington Road, Whalley Range, Manchester.
O *P* Roebuck, W. Denison, M.Sc., F.L.S., 259, Hyde Park Road, Leeds.
1901. Rooth, J. A., M.R.C.S., 6, Richmond Terrace, Brighton.
1905. Rope, Geo. T., Blaxhall, Tunstall, Suffolk.
1893. Roseburgh, John, Market Square, Galashiels, Roxburgh.
1892. Rosevear, John Burman, 109, New King's Rd., Fulham, S.W.
1910. *L* Rowe, A. W., M.S., M.B., M.A.C.S., F.G.S., Shottendane, Margate.

1914. Saban, Alfred J., 318, Ivydale Road, Peckham Rye, S.E.
1906. Salisbury, Albert E., 12a, The Park, Ealing, W.
1877. *P* Scharff, Robert F., Ph.D., M.R.I.A., Knockranny, Bray, co. Wicklow.
1906. Schepman, M. M., Bosch en Duin, Huister Heide, Utrecht, Holland.
1895. *L* Schill, C. H., Crosten Towers, Alderley Edge.
1886. Scott, Thomas, LL.D., F.L.S., The Laboratory, Bay of Nigg, Fishery Board for Scotland, Aberdeen.
1893. Shackleford, Rev. Lewis John, 66, Granville Road, Blackpool.
1910. *L* Shaw, H. O. N., B.Sc., F.Z.S., Skreens Park, Roxwell, near Chelmsford.
1904. Shaw, Rev. W. A., Peper Harow Rectory, Godalming.
1906. Shopland, Commander E. R., Cecilia House, The Avenue, Lowestoft.
1910. Shrubsole, George, Elm Bank, Workington, Cumberland.

1895. Sich, Alfred, F.E.S., Corney House, Chiswick, W.
1905. Simpson, James, c/o G. Sim, Esq., A.L.S., 52, Castle Street, Aberdeen.
1902. Smallman, Raleigh S., Eliot Lodge, Albemarle Road, Beckenham.
1886. *P* Smith, Edgar A., I.S.O., F.Z.S., 22, Heathfield Road, Acton, W.
1892. Smith, Mrs. Louisa J., Monmouth House, Monmouth St., Topsham, Exeter
1899. *L* Smith, Mrs. Lucy A., Cricklade Street, Cirencester.
1907. Smith, Maxwell, Hartsdale, Westchester Co., New York, U.S.A.
1894. Smith, Wm. Chas., 92, Dawes Road, Fulham, S.W.
1900. Solly, E. H., Lea Orchard, Ottinge, Elham, near Canterbury.
1886. Sowerby, Geo. Brettingham, F.L.S., River Side, Kew, near London.
1907. Spence, G. C., 10, Pine Grove, Monton, Eccles, Lancs.
1914. Stainton, Ernest, 70, Jubilee Road, Doncaster.
1906. Stalley, Henry J., Thorntona, Oxted, Surrey.
1886. *P* Standen, Robert, The Museum, The University, Manchester.
1911. Standish, C. M., Prospect House, Weldbank, Chorley.
1915. Steenberg, C. M., Mag. Sc., Royal Observatory, Ostervoldgade, 3, Copenhagen.
1903. *L* Stelfox, A. W., Ballymagee, Bangor, co. Down.
1906. Step, Edward, F.L.S., Oakwood House, Ashstead, Surrey.
1910. Stephenson, H. L., 90, Tempest Road, Beeston Hill, Leeds.
1908. *L* Stobart, H. J. S., Belbroughton, Stourbridge.
1896. Stonestreet, Rev. W. T., B.D., F.R.S.L., c/o The New Church Book Depôt, 18, Corporation Street, Manchester.
1897. Stracey, Bernard, M.B., 26, De Montfort Street, Leicester.
1890. Stubbs, Arthur Goodwin, The Meads Cottage, Hailey Lane, Hertford.
1893. Stump, Edward C., Balgownie, Rochdale Road, Blackley, Manchester.
1912. Sturt, E. G. M., Lismore, Cavendish Road, Weybridge.
1912. Sturt, G. L., Lismore, Cavendish Road, Weybridge.
1895. Swanton, E. W., The Educational Museum, Haslemere, Surrey.
1888. *P* Sykes, Ernest Ruthven, B.A., F.L.S., Longthorns, Blandford.

1910. Tattersall, W. M., D.Sc., The Museum, The University, Manchester.
1895. Taylor, Frederick, 32, Landseer Street, Park Road, Oldham, Lancs.
1907. Taylor, G. H., School House, Higher Blackley, Manchester.
1904. L* Taylor, Gerald Medland, Rossall School, Fleetwood.
1907. Taylor, J. Kidson, 45, South Avenue, Buxton.
1904. Taylor, Thos., Middlemore Avenue, Mangere, Otahuhu, New Zealand
1903. Thaanum, D., 5, Church Street, Hilo, Hawaiian Islands.
1908. Thomas, Rev. R. E., M.A., St. Martin's Clergy House, Salisbury.
1907. *L* Thornton, H. G., Kingsthorpe Hall, Northampton.
1886. *L* Tomlin, J. R. le Brockton, M.A., F.E.S., Lakefoot, Reading.
1906. Turton, Lt.-Col. W. H., D.S.O., R.E., 80, Caledonia Place, Clifton, Bristol

1907. Upton, Charles, Rooksmoor, Tuffley Avenue, Gloucester.

1914. Van der Sleen, Dr. W. G. N., Eidenoutstraat 63, Haarlem, Holland.
1915. Van Hyning, T., Curator, Florida State Museum, Gainesville, Fla., U.S.A.
1899. Vaughan, J. Williams, J.P., Pen-y-maes, Hay, *via* Hereford.
1897. Vignal, Louis, 28, Avenue Duquesne, Paris.
1902. Vincent, W. C. W., 39, West Bank, Stamford Hill, London, N.

1898. Wakefield, H. Rowland, 7, Montpelier Terrace, Swansea.
1891. Walker, Bryant, 1306, Dime Bank Building, Detroit, Michigan, U.S.A.
1907. Wallis, E. A., Springfield, West Parade, Scarborough.
1900. *L* Watson, Hugh, Bracondale, The Avenue, Cambridge.
1908. Weaver, G. H., 31, Devonshire Road, Palmer's Green, N.
1900. Webb, Walter F., 202, Westminster Road, Rochester, N.Y., U.S.A.

1902. Weeks, Wm. H., jr., 508, Willoughby Avenue, Brooklyn, N.Y., U.S.A.
1895. Welch, Robert John, M.R.I.A., 49, Lonsdale Street, Belfast.
1913. Western, W. H., 9, Redearth Road, Darwen.
1907. Wheat, Silas C., 987, Sterling Place, Brooklyn, N.Y., U.S.A.
1886. Whitwell, Wm., Brookside, Darley Knowle, Warwickshire.
1911. * Williams, James M. M., Imperial House, Pontlottyn, Cardiff.
1889. Williams, John M., 31, Grove Park, Liverpool.
1915. Wilman, Miss M., The McGregor Museum, Kimberley, South Africa.
1913. Winckworth, Ronald, 37, Upper Rock Gardens, Brighton.
1890. Wood, Albert, Midland Lodge, Sutton Coldfield, Warwickshire.
1910. Woodcock, R., Fauvic, Jersey.
1901. *L* Woodruffe-Peacock, Rev. E. A., F.L.S., etc., Cadney, Brigg, Lincs.
1911. Woods, Rev. F. H., B.D., Bainton Rectory, Driffield.
1898. Woods, Henry, M.A., F.G.S., 39, Barton Road, Cambridge.
1886. *L* Woodward, Bernard B., F.L.S., etc., 4, Longfield Rd., Ealing, W.
1903. Worsdale, R., 102, Dudley Terrace, Dudley Road, Grantham.
1914. Worsfold, Herbert W., 28, Melody Road, Wandsworth, S.W.
1895. Wright, Charles East, Neale Avenue, Kettering.

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Occurrence of a Pearl in Littorina littorea Linné.—In July, 1915, my friend, Mr. Alexander C. Smith, of Claremont, Perth, was staying at Westhaven, Carnoustie, near the mouth of the Tay, where he collected some specimens of *Littorina littorea*. On examining these, he found under the mantle of one of them what appears to be a genuine pearl. It is 2 mm. in diameter, of a pale horn colour, almost spherical, and slightly translucent. It is similar to the small brown seed pearls, frequently found in *Unio margaritifer*. So far as I am aware, this is the first time that a pearl has been found in this species, or, indeed in any British marine univalve.—HENRY COATES (*Read before the Society*, Oct. 16th, 1915).

Zonitoides nitidus (Müll.) **New to Herefordshire.**—I found this species fairly plentiful in the dried-up bed of the canal near Wellington Heath last June, and a few days later obtained it again in marshy ground on the banks of the Mathon Brook between Mathon and Old Country. In each case it was associated with *Succinea elegans* Risso and *S. putris* L., and in the second locality also with a small dark form of *Euconulus fulvus* (Müll.)—probably var. *alderi* Gray. It seems rather remarkable that *Z. nitidus* should have been for so long overlooked in Herefordshire, where there are many suitable habitats for it. Mr. J. W. Taylor has kindly verified my determination. Mr. Tomlin writes that he took the species in 1911 in damp ground in Stoke Edith Woods, and on the borders of the county near Pontrilas.—NORMAN G. HADDEN (*Read before the Society*, Nov. 10, 1915).

DISCOVERY OF HYGROMIA UMBROSA Partsch IN ENGLAND.

By JOHN W. TAYLOR, M.Sc.

(Read before the Society, Dec. 8th, 1915).

Mr. J. C. Dacie, a devoted student of the *Littorinidæ*, and a valued member of our Society, was so fortunate as to find living specimens of *Hygromia umbrosa* at Margate, during September of last year. They were living in association with *H. striolata*, *H. cantiana*, and other species, and add another interesting species to our fauna.

This very distinct species has, however, been previously twice recorded as British by Messrs. Kennard and Woodward (Proc. Malac. Soc., Nov., 1897, p. 243 and figs.; and The South-Eastern Naturalist, 1905, pp. 4, 5), both records being based upon four fossil shells of Pleistocene age, found by the distinguished palæontologist, Mr. W. J. Lewis Abbott, in the Ightham fissure, Kent; but these specimens were afterwards considered to be modified *Hygromia striolata*, and the records have now been withdrawn, so that Mr. Dacie's find is really its first undoubted occurrence in this country.

Mr. Dacie was at first inclined to regard the shells as a somewhat peculiar form of *H. striolata*, and as such exhibited his specimens at a meeting of the London Branch of the Conchological Society; but at this meeting the members present were so impressed with the peculiarities presented by the shells that Mr. Dacie was urged to send them to myself for examination.

Hygromia umbrosa may be easily distinguished by many striking testaceological characters from *H. striolata*, with which the Margate shells were at first confused. Amongst its distinguishing features may be mentioned the distinctly granulate surface of the shell, as opposed to the simple striation of *Hygromia striolata*; the much greater tenuity and transparency of the shell substance, and its usually peculiar greenish tinge; the excessively oblique and somewhat expanded aperture; the closely-approximating margins, with little or no trace of the submarginal rib, so perceptible in *H. striolata*; the widely expanded umbilicus, etc.

Little is known of the internal organization of *H. umbrosa*, but it is credited with possessing only one love-dart, which is described as smooth and conical, and it is thus removed from intimate alliance with *H. striolata*, which always possesses a pair of these weapons, and, in addition, an extra pair of accessory glandular sacs.

The distribution of this species is another illustration of the expulsion of a subdominant or weaker species from the active evolutionary area, which its present known range incompletely encircles, as it embraces the elevated mountain plateaus of Bavaria, Posen, Thuringia, Saxony, Silesia, Suabia, and Wurtemberg, and the Harz Mountains of Central Germany. In Austro-Hungary it inhabits the entire range of the Austrian Alps, and is known from Austria, Bosnia, Bohemia, Carniola, Carinthia, Croatia, Galicia, Moravia, Salzburg, Styria, Transylvania, and the Tyrol.

It is found throughout the montane districts of Switzerland, and is recorded by Dr. Mörch from the Island of Zealand, and in the present communication from East Kent in Great Britain.

Mr. Dacie hopes in the spring to revisit the precise spot, and collect the living mollusk, so that the animal and its internal organization may be adequately studied.

It will doubtless be suggested that the species has been introduced to the locality where it was found by some enthusiastic conchologist, or accidentally; but everyone who has endeavoured to introduce species of mollusks into other localities, except to places where the fauna is distinctly inferior in organization to the species proposed to be introduced, will probably acknowledge the practical impossibility of success; and until definite and credible information of such introduction is afforded in the present instance, I regard these shells as genuine inhabitants of this country.

I cannot but regret as unfortunate the unnecessary haste of those who always regard as artificial introductions every new form found within our limits, especially if previously unknown from the recent geological deposits in this country which have as yet been very cursorily and slightly examined.

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Note on Urocoptidæ. — The groups comprised in this family vary in their method of reproduction, some being oviparous, and others viviparous. Thus *Eucalodium walpoleanum* amongst others is known to be oviparous (see Pils. Man., vol. xvi., p. ix.), whilst *Brachypodella* (*Mychostoma*) *agnesiana* (C. B. Ad.), *B.* (*Apoma*) *chemnitziana* (Fér.), and *gracilis* (Wood)—*vide* Gloyne, *Journal of Conchology*, vol. i., p. 53, *B.* (*Liparotes*) *obesa* (W. and M.), and *suturalis* (Wein.)—*vide* Clapp, "Nautilus," vol. 28, p. 132—are viviparous. It may, therefore, serve a useful purpose to record the definite oviparity or otherwise of species when this can be ascertained. There are in my collection the whitish calcareous eggs of the following species:—*Coelocentrum gigas* von Marts. (oval, 3·5 × 4·5 mm.); *Anoma solida* var. *striatula* (long oval, 1 × 1·5 mm.); *Microceramus mexicanus* Pfr. (round, diameter ·75 mm.); *Urocoptis* (*Gongylostoma*) *lavalleana* d'Orb. (round, diameter 1 mm.); *Urocoptis* (*Idiostemma*) *intusmalleata* Gund. (round, diameter ·9 mm.). Perhaps some brother conchologists can amplify this meagre list.—GEO. C. SPENCE (*Read before the Society*, Sept. 8th, 1915).

ADDITIONS TO THE LAND AND FRESHWATER MOLLUSCA OF JURA, COLONSAY WITH ORONSAY AND ISLAY.

BY J. F. MUSHAM, F.E.S.

(Read before the Society, Jan. 13th, 1915).

THESE islands form the Vice-County 102, or Ebudes South, and with the exception of Islay are off the track of ordinary tourist traffic.

By their position one would naturally be led to expect a continuity north of the Donegal forms of the more conspicuous, dominant species; but observations so far seem to negative such a proposition, as instanced by the Donegal form of *Helix nemoralis* occurring in numbers on the Island of Iona (Ebudes Mid), twenty nautical miles N. by W. of Colonsay, whereas on Colonsay it favours the type in size and shape, and is absent altogether, as far as observed, from the larger areas of Islay and Jura. Further field-work is here required, but will take time, as, with the exception of Islay, the group is very difficult to investigate.

Jura, some 30 miles by 9 miles, has only one decent road at the southern end, and accommodation for strangers is restricted to one private house near the landing-pier in Small Isles Bay.

The Island of Islay has an extensive area under cultivation, and large peat beds, which supply the nine distilleries round the coast. The sand-dunes of Kilnaughton and Machrie, near Port Ellen, swarm with shells, and well repay a visit.

On Colonsay the same conditions obtain on the golf-links of Machrins and Kiloran Bay.

Oronsay is difficult of approach, and a certain amount of adventure is experienced in getting to the island, the usual mode being by conveyance from the hotel at Scalasaig, across the strand at certain states of the tide, and the water often for upwards of a mile reaches to the horse's girths. Consequently the time at one's disposal is short.

The first record we have for this group is in Forbes and Hanley's *British Mollusca* (1853), and relates to *Limax arborum*. About 1900 and later specimens were received from Mr. W. and Miss Evans, and from Staff-Surgeon K. H. Jones, totalling some nine species.

No fresh species seems to have been added to the list until my visit to Jura and the north-east coast of Islay in June, 1908, when, notwithstanding the spell of dry weather, the list was increased to fifteen.

I arranged to pay another and more extensive visit in 1913, and June 28th found me at Colonsay, where several specimens were collected, but the bulk of these was unfortunately lost in transit to the Referee, necessitating another visit a month later.

This was a very unfortunate loss, as the weather had turned hot and dry; but by close search the list was increased to thirty-three, making the total for this Vice-County to date 9 slugs, 20 land and 4 freshwater shells, distributed as follows.

The asterisk (*) marks a new Vice-County record.

Limax maximus L.—Craigen House, Jura, 28/6/08; numerous.

Limax maximus var. *fasciata* (Moq.).—Loch Ba House, Port Charlotte, Islay, 11/90 (W. Evans); Port Askaig, Islay, 29/6/08.

Limax arborum B.Ch.—Recorded for Islay (Forbes and Hanley, l.c.); Jura, 27/6/08, frequent; Port Askaig, two, 29/6/08.

**Limax tenellus* Müll.—Near Craigen House, Jura, 27/6/08, one adult under decayed wood in middle of a small meadow.

Agriolimax agrestis (L.), with its var. *reticulata*.—Numerous and generally distributed on the four islands.

Arion ater (L.).—Machrie, Islay, 8/04 (Miss E. Evans); Jura, 28/6/08; Port Askaig, 29/6/08.

Arion ater var. *aterrima* Taylor.—Machrie, 8/04 (Miss E. Evans); Colonsay, 26/6/13, frequent.

**Arion ater* var. *castanea* D. and M.—Kilnaughton Bay, Islay, 27/7/13, frequent.

Arion circumscriptus Johnst.—Port Charlotte, Islay, 11/90 (W. Evans); Craig House, Jura, 27/6/08; Colonsay, 29/7/13, numerous.

**Arion hortensis* Fér.—Scalesaig, Colonsay, 3/7/13, a few.

**Arion minimus* Sim.—Abundantly distributed over Islay and Colonsay, approaching *A. agrestis* in point of numbers.

**Arion minimus* var. *grisea* Roebuck—Colonsay, 29/6/13, frequent.

**Arion subfuscus* (Drap.).—No typical specimens.

**Arion subfuscus* var. *rufofusca* Drap.—Port Ellen, 27/7/13.

**Arion subfuscus* var. *cinereofusca* Drap.—Port Ellen, 27/7/13.

**Hyalinia cellaria* (Müll.).—Jura, 27/6/08; Colonsay, 29/7/13; Bridgend, Islay, 28/7/13, numerous.

**Hyalinia cellaria* var. *compacta* Jeff.—Jura, 27/6/08.

**Hyalinia alliaria* (Mill).—Machrins, Colonsay, 29/6/13; Port Ellen, Islay, 28/7/13; Bridgend, 28/7/13, frequent.

**Hyalinia alliaria* var. *viridula* Jeff.—Jura, 28/6/08.

**Hyalinia nitidula* (Drap.).—Oronsay (Dr. Norman); Machrins, Colonsay, 29/7/13.

Hyalinia nitidula var. *lucens* Pult.—Colonsay, 30/7/13, frequent.

**Hyalinia radiatula* (Alder).—Colonsay, 28/6/13, scarce.

**Hyalinia crystallina* (Müll.).—Port Askaig, 29/6/08, amongst dead leaves.

**Euconulus fulvus* var. *mortoni* (Jeff.).—Carn Mor, Colonsay, 29/6/13; Port Ellen, Islay, 27/7/13, a few.

Pyramidula rotundata (Müll.).—Frequent in Islay, Colonsay, and Jura.

Helix aspersa Müll.—Hotel garden, Scalasaig, Colonsay, 28/6/13; Oronsay Priory Ruins, behind tomb-stones, 30/6/13, frequent; Port Ellen, Islay, 26/7/13, numerous in crevices of old stone walls.

Helix nemoralis L.—Machrins golf-links, two colonies (Staff-Surgeon Jones and myself); many of the rabbit-holes had a quantity of these shells apparently eaten by these rodents lying empty in and around. All the living specimens taken were very much bleached, but of special interest on account of the frequency of dark and broad-banded forms as the following formulæ will shew:—(12)3(45), fourteen; (123)(45), fourteen, var. *roseolabiata*; 12345, each band very broad, forty-four.

Var. *albolabiata* occurred amongst these:—(123)45, ten; (12)345, sixteen; 1(23)45, seven; 123(45), four; 00345, two; 00300, two; 003(45), one; 00000, six, mouth flushed purple.

**Helix hortensis* Müll. var. *lutea* Moq.—12345, in a garden, Craigen House, Jura, 28/6/08, scarce.

**Helicigona arbustorum* (L.).—Jura, 29/6/08, one juvenile.

Helicella itala (L.).—Machrins, Colonsay; Kiloran Bay, Colonsay (Staff-Surgeon Jones); Machrins, rabbit-eaten examples numerous in and around the burrows, 28/6/13; Kilnaughton Bay, Islay, 28/7/13, very fine, but not numerous.

Helicella itala var. *leucozona* Moq.—Kiloran Bay, 29/7/13.

Helicella itala var. *hyalozonata* Ckll.—Kiloran Bay, 29/7/13.

Helicella acuta (Müll.).—Swarming on Islay and Colonsay on sand-dunes; many fine examples at Kilnaughton Bay, Islay, 26/7/13.

Helicella acuta var. *strigata* Menke.—Machrins, frequent.

**Hygromia hispida* (L.).—Port Ellen, 28/7/13, scarce.

**Hygromia granulata* (Alder).—Machrins, under old wall, 27/7/13, frequent.

Pupa cylindracea (DaCosta).—Swarming everywhere. Jura, 29/6/08; Port Ellen, 27/7/13; Bridgend, 28/7/13; Oronsay, 30/6/13; Colonsay, 30/7/13.

P. cylindracea var. *curta* West.—Colonsay, 30/7/13.

**Sphyradium edentulum* (Drap.).—Carn Mor, Colonsay, 28/6/13, 29/7/13, frequent.

**Balea perversa* (L.).—Carn Mor, 28/6/13, on distillery walls; Port Ellen, 28/7/13, plentiful.

Clausilia bidentata (Ström).—Swarming at all places visited.

**Cochlicopa lubrica* (Müll.).—Colonsay, 29/6/13, scarce; Port Ellen, 26/7/13, scarce.

Limnæa pereger (Müll.).—Frequent in the wells on Colonsay, and shallow draining grips on the mosses; also in Loch Fada, June and July, 1913.

**Planorbis spirorbis* var. *rotundata* Poiret.—In a dyke near the post-office, Colonsay, in company with *Pisidia*.

Ancylus fluviatilis Müll.—In the burn, golf-links, Colonsay, 28/6/13, numerous Lagavullin, Islay, 27/7/13.

**Pisidium pusillum* (Gm.).—In the shallow draining grips, Machrins Burn, and Loch Fada, Colonsay, 28/6/13.

**Pisidium pulchellum* Jenyns.—Numerous in a dyke near post-office, Scalasaig, 31/7/13.

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EDITORIAL NOTES.

On behalf of the Society we venture to tender our deepest sympathy to M. Dautzenberg for the loss of his son Charles, of the 39th Régiment d'Artillerie, who was killed at Neuville-Saint-Vaast on the 12th of May last, at the age of 23.

At a meeting of the London Branch, held on October 14th last, it was decided to suspend the meetings until further notice, and to retain the present office-bearers in office for another year.

The splendid series of monographs now appearing on the Fauna of British India, including Ceylon and Burma, has recently been augmented by a second volume on the Mollusca. Vol. I., by the late W. T. Blanford and Lt.-Colonel Godwin-Austen, appeared in 1908, and comprised the *Testacellidæ* and *Zonitidæ*.

We are now glad to welcome a most able volume of over five hundred pages, by Mr. G. K. Gude, dealing with thirteen more families, from the *Trochomorphidæ* to end of the *Janellidæ*, and including the *Endodontidæ*, *Helicidæ*, *Enidæ*, *Pupillidæ*, and *Clausiliidæ*--in other words what are to the majority of conchologists the most interesting and attractive groups of the *Pulmonata*. For convenience Mr. Gude groups the four families of slugs together, without reference to their systematic position.

The total number of species recorded in this volume is 485, of which the two families *Helicidæ* and *Ferussacidæ* account for exactly half, *Glessula* with 97 species being the largest single genus.

One turns first, naturally, to the *Corillinæ*, of which, as is well known, Mr. Gude has for many years made so special a study. His account, therefore, of the Indian members of this sub-family is of particular importance, and we are glad to find that almost every species is illustrated with figures, both of the shell and of its internal armature. The practical value of these lamellæ within the shell, in defending the snail against the predatory attacks of insects, is well illustrated by a quotation from a paper of Godwin-Austen's :—"When breaking up a number of shells [*i.e.*, of *Plectopylis*] to expose the barriers and ascertain if their characters were constant, I was greatly interested to find in two instances the presence of small insects that had become fixed between the teeth." It is interesting to find that the genus *Vallonia* has four representatives in India, and that both *V. pulchella* and *V. costata* penetrate as far south as Kashmir. The *Enidæ* are well developed with 31 species. Two sub-genera of *Ena*—both confined to N.W. India—Mr. Gude regards as palæarctic immigrants, viz., *Subzebrinus*, which shows a close affinity with Central Asiatic forms ; and *Serina*, with Chinese relationships. On the other hand, the sub-genus *Mirus* (a group which reaches to Japan) seems to be endemic.

The *Pupillidæ* are represented by 23 species, including *P. muscorum*, of which the Indian race is described as "always toothless, usually more slender, palatal crest less developed" (var. *asiatica* Mllff.).

We welcome the disappearance of the uncouth-sounding name *Jaminia*, and hope that, as *Pupa* had to go, the stability of *Pupilla* is now assured.

Then follow *Clausiliidæ* with 30 spp. ; *Achatinidæ* (39 spp.) ; *Ferussacidæ* (102 spp.) ; and *Succineidæ* with the curious genera *Lithotis*, *Camptonyx*, and *Camptoceras*. In the absence of anatomical details, the position of the last genus is still uncertain, and Fischer placed it in the *Physidæ*.

We have noticed a few trivial errors in the systematic index, *e.g.*, *Achatina fusca* Fér. for *fulica*, while genus 2 of the *Pupillidæ* appears as *Columella*, whereas on p. 40 it is called *Sphyradium*.

We can heartily congratulate Mr. Gude on the achievement of an eminently sound and masterly piece of work.

* * *

In a recent issue of the [1]Transactions of the North Staffordshire Field Club, Mr. H. Overton has a very interesting paper on Holocene shells obtained at Letocetum, the Roman station unearthed at Wall in Staffordshire. Thirty-six species of land and freshwater mollusca are enumerated, of which only nine occur in the locality at the present time. The most interesting species mentioned is perhaps *Hygromia liberta* Westerlund (= *H. sericea* Drap. nec Müll.), while *Vallonia costata* Müll., *Helix aspersa* Müll., *H. nemoralis* L., *H. arbustorum* L., and *Pupilla cylindracea* daC. were more or less plentiful. Five marine species are also listed, as well as a number of Mammals.

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[1] Trans. N. Staffs. Field Club, vol. xlix., 1915, pp. 87—91.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

444th Meeting, held at the Manchester Museum, Sept. 8th, 1915.

Mr. E. Collier in the chair.

Additions to the Library announced and thanks voted :—

"*Journal of Conchology*," several numbers completing Volume I. (*presented by Mr. W. Denison Roebuck*).

"Statistical Methods with Special Reference to Biological Variation," by C. B. Davenport (*presented by Dr. A. E. Boycott*).

"Salient Features in the History of the Yorkshire Naturalists' Union" (Presidential Address, 1904), by W. Denison Roebuck.

"The Genus *Clausilia*" (Presidential Address to the Malacological Society, 1915), by the Rev. A. H. Cooke.

"The Philippine Land Shells of the Genus *Schistoloma*," by P. Bartsch.

"Manual of Conchology," part 90, by H. A. Pilsbry.

"Holocene Mollusca of Letocetum," by H. Overton.

"The Recent and Fossil Mollusks of the Genus *Rissoina* from the West Coast of America," by P. Bartsch.

"On the Non-Marine Mollusca of a Post-Pliocene Deposit at Apethorpe, Northamptonshire," by A. S. Kennard and B. B. Woodward.

"On *Helicella* (*Candidula*) *crayfordensis* n.sp., from the Pleistocene Deposits of South-Eastern England," by A. S. Kennard and B. B. Woodward.

"Report on the Mollusca (Lancashire and Cheshire Fauna Committee)," and "*Pisidium supinum* A. Schmidt in South Lancashire," by J. Wilfrid Jackson (*from the respective authors*); and the usual periodicals received in exchange.

Donations to the Autograph Collection announced and thanks voted :—

R. Ashington Bullen, Ew. Wust, Com. Caziot, A. C. Johansen, L. Richardson, P. Hesse. Donor : A. S. Kennard.

New Members Elected.

T. van Hyning.
C. P. Hurst.

Candidate Proposed for Membership.

Henry Day, M.Sc., Clifton Terrace, Hayfield Road, Chapel-en-le-Frith.

Papers Read.

"*Littorina littorea* L., a Doubtful Record," by J. C. Dacie.

"Some Notes on *Limnæa peregser* m. *sinistrorsum*," by W. H. Hutton.

"Note on *Urocoptidæ*," by G. C. Spence.

"Note on the var. *fascialba* Taylor of *H. nemoralis* L.," by J. E. A. Jolliffe.

"A New Variety of *Voluta africana* Reeve," by Lewis J. Shackleford.

Exhibits.

By Mr. E. Collier : *Limax maximus* sub-var. *punctata*, a very large specimen, from Broadway, Worcestershire.

By Mr. G. C. Spence : Eggs of *Urocoptidæ* and *Coelocentrum eisenianum* Pils., to illustrate his paper ; also a series of *Holospira*, from Arizona and New Mexico, and some newly-described species from Cuba.

By Mr. C. H. Moore : A number of Tasmanian marine shells.

By Mrs. Gill: Series of *Liguus*, *Orthalicus*, and *Porphyrobaphe*.

By Mr. J. Wilfrid Jackson: Specimens of *Eurydesma* from the Permo-Carboniferous rocks of New South Wales, to show the extraordinary thickness of the valves in the umbonal region.

By the Rev. Lewis J. Shackleford: A series of *Voluta africana* Reeve to illustrate his paper.

445th Meeting (Annual Meeting) held at the Manchester Museum, Oct. 16th, 1915.

Mr. R. Bullen Newton, F.G.S., in the chair.

The following members and visitors were present:—

Messrs. R. Bullen Newton, A. E. Boycott, R. Standen, G. C. Spence, B. R. Lucas, E. D. Bostock, L. J. Shackleford, G. Fysher, R. Harrison, E. R. Brown, W. Denison Roebuck, W. M. Tattersall, J. W. Taylor, E. Collier, F. G. Percival, D. M. S. Watson, J. R. le B. Tomlin, G. H. Taylor, Fred Taylor, R. Standen Jackson, Mr. and Mrs. J. Wilfrid Jackson, Miss A. Standen Jackson, Mr. and Mrs. C. H. Moore, and Mr. and Mrs. Gill.

Additions to the Library announced and thanks voted:—

"The Mollusca of Porto Rico," by W. H. Dall and C. T. Simpson (*presented by the Manchester Museum*).

"Report on the Turton Collection of South African Marine Mollusks, with Additional Notes on other South African Shells contained in the United States National Museum," by P. Bartsch (*from the author*); "Description of a New *Rissoina*," by J. R. le B. Tomlin (*from the author*); and the usual periodicals received in exchange.

Donations to the Autograph Collection announced and thanks voted:—

Henry Hemphill, Alfred Caruana Gatto, F. P. Marrat. Donor: J. R. le B. Tomlin.

Appointment of Auditors.

Messrs. C. H. Moore and F. Taylor were appointed Auditors.

Appointment of Scrutineers.

Messrs. G. Fysher and G. C. Spence were appointed Scrutineers.

New Member Elected.

Henry Day, M.Sc.

Candidate Proposed for Membership.

Miss M. Wilman, The McGregor Museum, Kimberley, S. Africa (introduced by J. R. le B. Tomlin and L. J. Shackleford).

Member Deceased.

Miss Amy C. S. Foster.

Members Resigned.

Henry Preston, F.G.S.
J. R. Charnley, F.Z.S., F.E.S.

Members Struck off the List (Rule IV.).

Prof. Raffaello Bellini.
Hermann Rolle.
Cuthbert Freyberg.
Clement L. Wragge, F.R.G.S.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for the year 1915–1916 had been elected as nominated by the Council (see p. 2).

Election of Trustees.

The resignations of the Founders of the Society, J. W. Taylor and W. Denison Roebuck, as Trustees having been accepted :—

It was proposed by Lewis J. Shackleford and seconded by J. R. le B. Tomlin, and carried unanimously "That Messrs. James Cosmo Melvill and Edward Collier be elected Trustees of the Society in pursuance and for the purposes of Rule XIV. of the Society."

On the motion of Lewis J. Shackleford, seconded by J. R. le B. Tomlin, it was resolved "That an inventory of the Collections, Library, and other property of the Society be made, and annually revised and certified as correct by two members of the Council of the Society."

Honorary Member.

On the nomination of the Council, and on the motion of R. Bullen Newton (President), seconded by Edward Collier (Vice-President), William Denison Roebuck, M.Sc., F.L.S., was unanimously elected an Honorary Member of the of the Society in place of Dr. Strebel, deceased.

President's Address.

Mr. R. Bullen Newton, F.G.S., of the British Museum, gave his Presidential Address "On the Conchological Features of the Lenham Sandstones of Kent and their Stratigraphical Importance."

The best thanks of the Society were unanimously voted to Mr. Newton, and votes of thanks were also passed to the Authorities of the Manchester Museum, Leeds University, and the Cartwright Hall, Bradford, for the use of rooms for the meetings of the Society.

Papers Read.

"Further Notes on *Bursa rubeta* L.," by C. Hedley.

"Occurrence of a Pearl in *Littorina littorea* L.," by H. Coates, F.R.S.E.

"Conchological Notes from the Balkans, etc.," by L. E. Adams, B.A.

"Note on *Trichotropis antarcticus* M. & S. (non Thiele)," by J. Cosmo Melvill, M.A., D.Sc., and R. Standen.

Exhibits.

By Mr. J. W. Taylor : A series of the original coloured drawings used in the illustrating of his Monograph ; a beautiful enlargement of a photograph of ***Helix pisana*** at Tenby ; and, on behalf of Mr. Albert Salisbury, specimens of ***Physa*** *heterostropha* from the canal at Aylesbury, Bucks.

By Mr. R. Standen : A series of colour varieties of ***Cypræa arabica*** ; pellucid forms of *C. erosa* and *C. variolaria* ; *Dentalium eupatrides* from 1,410 fathoms, Antarctic ; *Chenopus senegalensis*, *C. occidentalis* ; set of ***Chenopus pespelicani***, from minute stages of growth to adult, from Southport ; *C. serresianus* young and adult, dredged off the Irish coast ; also fine examples of ***Cassidaria tyrrhena*** and *Ranella gigantea* from deep water in the same locality ; and a collection of ***Pedicularia***—most of the species being ***in situ*** on the corals ***Gorgonia*** and ***Allopora***, on which these curious mollusks live commensally.

By Mr. Edward Collier : Family *Buliminidæ*, over two hundred species and varieties, including many rare forms from Asia Minor, Caucasus, Turkestan, China, etc., including the genera *Pachnodes*, *Rhachis*, *Cerastus*, *Ovella*, *Buliminus*, *Chondrula*, *Pupoides*, and *Passamaella*.

By Mr. H. Coates: Pearl from *Littorina littorea*; the pearl is round, pink in colour, and with it was shown the shell from which it was taken.

By Mrs. Gill: Four drawers of *Opisthobranchiata*, including examples of most of the genera.

By Mr. G. C. Spence: Series of Mexican and United States *Holospira*; *Opeas* and *Achatina*; *Coelocentrum* (*Spartocentrum*) *eisenianum* Pils., Lower California, and other *Urocoptidæ*, including the following recently described species:—*U.* (*Gongylostoma*) *mayensis* T. & R.; *U.* (*Arangia*) *scobinata* T. & R.; *U.* (*Idiostemma*) *pilsbryana* Rams.; *B.* (*Gyraxis*) *ramsdeni* Torre—from Cuba.

By the Manchester Museum:—Permo-Carboniferous mollusca from New South Wales and Tasmania; series showing range of variation in a single species, *Planorbis multiformis* from the Miocene of Steinheim; series of specimens illustrating the ancestry of *Trigonia margaritacea* Lam.

By Mr. J. R. le B. Tomlin:—*Opeas urichi* Smith from Kew Gardens; very fine live specimens of *Macron kellettii* Fbs., and *M. æthiops* Rve., from California; series of live examples of *Latiaxis lischkeana* Dkr., *L. deburghiæ* Rve., *L. japonica* Dkr., *L. mawæ* Gray, and *L. armatus* Sow., all from Japan; a number of species of *Marginella*, including *M. labrosa* Redf., *M. saulcyana* Pet., *M. storeria* Couth., *M. hindsiana* Pet., *M. oblonga* Sw., *M. amabilis* Redf., *M. carnea* St., *M. rostrata* Redf. (=*waliacei* Jouss.), *M. cincta* Kien., and *M. succinea* Conr.; and a very fine perfect example of *Pleurotomaria salmiana* Rolle from Tosa: this shell is brilliantly coloured with red markings, and measures almost 4 inches in altitude, with a diameter of 3½ inches at the base.

ANNUAL REPORT.

The present is the Thirty-Eighth Annual Report of our Society.

Owing to the confusion consequent on the outbreak of the war, it was not deemed advisable to hold the Annual Meeting last year, but the Report read at an ordinary meeting showed that in October last there were 322 members on our list, including 10 honorary members. During the twelvemonths we have lost 5 members by death, and 3 by resignation, whilst 7 new members have been elected, so that our membership now stands at 321.

The members whose decease the Society deeply laments are:—Dr. Strebel, Miss Foster, Miss Milner, and Messrs. Cash and Madison. Obituary notices have already appeared in reference to some of these in the *Journal of Conchology*.

Dr. Strebel's death causes a vacancy in our list of Honorary Members.

During the year the usual monthly meetings have been held, and the attendance has been fairly maintained in spite of the fact that many of our members have been throwing themselves enthusiastically into various branches of patriotic service. The meeting held in February was specially interesting as the opportunity was taken to present an illuminated address to Mr. J. W. Taylor, congratulating him upon the attainment of his seventieth year, and in recognition of the valuable services he has rendered to British conchology. In this connection it is fitting that we express our pleasure that the University of Leeds has conferred the degree of M.Sc. on Mr. Taylor, and also on our Honorary Recorder, Mr. W. Denison Roebuck. We heartily congratulate both these gentlemen upon this well-merited recognition of their scientific work.

The papers and notes read at the meetings have been thirty-one in number, and the exhibits have often been of exceptional interest. There have been special exhibits in the following genera:—*Alycæus*, *Bursa*, *Buliminus*, *Unio*, *Harpa*, *Neritula*, *Papuina*, and *Marginella*; and in several cases nearly all the known species of a genus have been got together for comparison.

The *Journal of Conchology* has been issued quarterly, and well maintains its circulation. The XIVth Volume is completed with the October number, and a glance at the exhaustive indices compiled by the Editor will show the wide scope and the amount of original work done by members who have contributed to its pages. Members will assist the Editor, and still further enhance the variety and interest of the *Journal*, by sending short notes of their observations, especially such as elucidate the habits and life-history of mollusca. The volume contains an unusual number of excellent plates and illustrations, many of which have been provided at the private expense of contributors, as, our annual subscription being so low, the funds of the Society do not allow of much expenditure in this direction. Our thanks are tendered especially to Mr. Lionel E. Adams, Professor Boycott, and Mr. Tomlin. The commencement in January next of the XVth Volume will give an opportunity for an effort to extend the circulation of the *Journal*, and the Council ask members to use their personal influence in this direction by bringing it under the notice of reference library committees and any others who may be interested in natural history.

A considerable number of our members is on active naval and military service, and to these we send hearty and most appreciative greetings and good wishes.

The Society is to be congratulated upon the fact that at a time of so great national disturbance and strain its affairs are in such a healthy condition, but in order that this may be maintained in the present year it will be necessary that every effort be made to keep up the interest of those who are already members and if possible get others to join the Society.

TREASURER'S REPORT.

Interim Statement of Accounts for the Year 1915.

RECEIPTS.	£	s.	d.	EXPENDITURE.	£	s.	d.
Cash in hand	26	12	4	Cost of *Journal* for Jan., 1915	12	5	11
Add error Cash in hand ...	0	10	0	Ditto for Apr., 1915	13	6	6
Subscriptions	34	7	0	Ditto for July, 1915	12	5	11
Sale of Publications ...	0	15	3	Cost of Illustrations	2	3	0
Advertisements	1	3	6	Do. Reprints	2	10	0
				Do. Stationery	1	11	6
				Taylor's Monograph, Part 20	0	5	3
				Cost of Photograph (Group)	0	2	0
				Editor's Expenses, 1914 ...	0	5	10
				Recorder's Expenses, 1914 ..	0	19	6
				Secretary's do. (Jan to Sept.)	6	8	6
				Balance in hand ...	11	4	2
	£63	8	1		£63	8	1

LIBRARIAN'S REPORT.

DURING the last year about forty-seven additions have been made to the Society's Library, this being much better than in previous years.

The most noteworthy addition has been the gift by Mr. W. Denison Roebuck of a number of missing parts of Volume I. of the *Journal of Conchology*, thus completing this volume in the Society's Library.

The Manchester Museum has also handed over two duplicate works, viz. :—"Histoire Naturelle des Mollusques Terrestres et Fluviatiles de la France," by J. P. R. Draparnaud; and "Complément de l'Histoire Naturelle des Mollusques Terrestres et Fluviatiles de la France, de J. P. R. Draparnaud," by A. L. G. Michaud.

Other donors of their papers are :—Messrs. C. Oldham, A. S. Kennard, B. B. Woodward, J. R. le B. Tomlin, L. J. Shackleford, H. O. N. Shaw, Drs. W. H. Dall, H. A. Pilsbry, P. Bartsch, and Lieut.-Col. H. H. Godwin-Austen.

The various donors and the titles of their papers are given in the Proceedings of the Society's meetings.

ANNUAL REPORT OF THE LEEDS BRANCH.

FOR the second year in succession there have only been nine meetings held, the absence of cheap fares and suitable railway arrangements being responsible for the cancelling of two of the summer rambles.

Three meetings were held in the field :—One at Harewood in April ; one at Keighley in June ; and one in the neighbourhood of Leeds in July.

Of the six indoor meetings, three were held in the Cartwright Hall, Bradford, and two in the University, Leeds. The February meeting was held in the University, Manchester, by invitation of the members of the Manchester centre. This meeting was of more than ordinary interest, as in addition to being the postponed annual meeting of the parent Society, it was made the occasion for a presentation to Mr. J. W. Taylor of an illuminated address by members of the Society, as a special mark of appreciation for his valued services to the science of conchology and for the great interest shown in the well-being of the Society of which he was one of the founders.

The President of the Society, Mr. R. Bullen Newton, F.G.S., made the presentation.

The museum was thrown open for inspection by the members, a boon which was fully utilised on every available occasion, especially by the visitors, and this special favour, granted by the University authorities, was highly appreciated.

The winter meetings continue to be well attended, and the members are further indebted to Mr. J. W. Taylor for his contributions on the life-history, distribution, etc., of the special exhibits of British species which have been shown. In addition to Mr. Taylor's remarks, there has been one paper by Mr. J. F. Musham, F.E.S., on the Genus *Cochlostyla*.

Many other interesting exhibits were shown and commented on by the members at our indoor meetings, which are always well attended, an indication of their popularity.

In July of the present year the Council of the Leeds University conferred the Honorary Degree of M.Sc. on Mr. J. W. Taylor and Mr. W. Denison Roebuck, F.L.S., as an appreciation of their labours and original work in connection with natural science.

The Branch has had to mourn the loss of one of its oldest and most valued members, Mr. Wm. Cash, F.G.S., who died in December last.

The membership at the present time is twenty-three and three corresponding members. Mr. J. F. Musham, F.E.S., is our President.

F. Booth, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

Since our last report only eleven meetings of this Branch have been held.

Eight of these were ordinary meetings, and were mostly well attended. Among the genera chosen as special exhibits very good series of *Ranella*, *Pterocera*, *Phasianella*, and the British forms of *Rissoa* and *Paludestrina* were shown. Besides these many interesting shells were brought to the meetings, and a few original notes were contributed, bearing chiefly on the special exhibits.

The field meetings were at Yiewsley, Hampton Wick, and Plumstead Marshes. No new records were made, but it was noticed that *Pisidium supinum* was quite scarce at Hampton Wick, where it was abundant in 1908.

The war has naturally made it impossible for some—and difficult for other—members to attend the meetings, so that our report is not so good as it might have been in normal circumstances.

J. E. Cooper, *Hon. Sec.*

ANNUAL REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

Chiefly on account of the war, the Branch has only held two winter meetings and one field meeting during the past year. One new member has been elected.

At the January meeting, held in the Free Library, Hanley, the President, Mr. J. R. B. Masefield, M.A., exhibited on behalf of Mr. H. Overton an interesting collection of mollusca obtained from sifting soil from a depth of four feet during excavations of the Roman encampment at Wall, near Lichfield. Thirty-five species were exhibited, including a specimen of *Vertigo pusilla*, which is a new species for Staffordshire. A noticeable feature was the absence of *Helix pomatia*.

The field meeting held in July took the form of a ramble to Sideway and Trentham, the canal being worked *en route*; fifteen species of freshwater mollusca were obtained, including fine examples of *Physa heterostropha*. Individual work done by members during the past year has resulted in new localities being recorded for several species of local mollusca. In May last, Mr. B. Bryan recorded a flourishing colony of *Arion ater* (Linné) var. *alba* near Longton, Staffordshire. A very large specimen of the same variety (six inches in length) with bright yellow fringe to foot-sole was found by Mr. Harold Daltry, in his garden at Madeley, Staffordshire, 11th August, 1915.

B. Bryan, *Hon. Sec.*

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NOTES ON THE GENUS HARPA.

By JAMES COSMO MELVILL, M.A., D.Sc.

(Read before the Society, 10th March, 1915).

Of all the genera of mollusca, few if any possess a more isolated 'facies' than the Harp-shells; and, coupled with this fact, is the extraordinary circumstance that, though very scantily represented specifically, the individual members so frequently run into each other that, from the time of Linnæus, 1767, who only enumerated two, to A. Sutor, in 1896, who admitted no less than sixteen species, a very wide divergence of opinion has persisted amongst all authors and students of the subject. Many of the recent forms are known to all, being of striking appearance, and of beauty hardly to be surpassed. Known by the short spire, much expanded and roundly inflated body-whorl, adorned with regular equidistant longitudinal ribs, these polished and often highly coloured and highly ornamented, of varied thickness, sometimes overlapping and acuminately 1-2 angled below the sutures, the intermediate spaces being decorated with an undulate pattern in most cases, and varied in body colour, the interior surface much polished and variegated, conspicuously blotched with brown; columella slightly incrassate, shining; canal short; operculum absent. All, with two exceptions, natives of the Eastern tropics, the two being *H. crenata* Swainson, from the West American shores, and the recently described *H. punctata* Verco from South Australia.

Rumphius, 1705, in pre-Linnean times was the first to signalise the genus under its commonly received name. Bolten, 1798, next utilised it; and it was finally adopted by Lamarck a year later (1799).

Other generic terms proposed are as follows:—

Cithara,[1] Klein, 1753.
Harpalis, Link (Rost. Samml., iii., p. 114), 1807.
Harparia Rafinesque (Anal. Nat.), 1815.
Lyra Griffith (Cuvier's Anim. King., xii., p. 234), 1834.

Dr. W. H. Dall[2] and Mr. C. Hedley[3] both consider, on the grounds just stated, that Bolten's authority for the establishment of the genus should be paramount. Hedley likewise would accept Bolten's specific names in several instances. In the forthcoming pages it will be seen that I agree with him in the main, though not in every case.

Linnæus, in both ed. x. (1758) and ed. xii. (1767) of his 'Systema Naturæ,' included under the collective name of *Buccinum* the members of this genus, with the great majority of purpuriferous marine gastropods, grouping them to some extent sectionally, with the following remarks, two species only being named :—

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[1] *Cythara* Schum. (Essai, p. 245), 1817, has since been applied to a well known section of *Pleurotomidæ*, type *C. citharella* Lamarck (An. Sans Vert., ix., p. 407).

[2] Dall in *Journ. of Conch.*, xi., p. 296 (April, 1906).

[3] Hedley in *Nautilus*, xxv., p. 65 (October, 1911).

⁂ *Detrita, columellæ labium quasi abrasum, planum.*

(*a*) *B. harpa.* "*B. testa varicibus æqualibus longitudinalibus distinctis mucronatis, columella lævigata.*"

(*b*) *B. costatum.* "*B. testa varicibus æqualibus longitudinalibus confertis mucronatis, columella lævigata, simillima præcedenti forte varietas, sed costæ approximatæ.*"

Mr. Sylvanus Hanley[1] after a close examination of the contents of the Linnean molluscan collections writes that—"Not only are almost all the Harp-shells comprehended in the synonymy of (*a*) as published in the 'Syst. Nat.', but they equally suit the brief description which accompanies it in that work. *H. nobilis*, *H. ventricosa*, and *H. minor* are all contained therein, and of these, the first named (*H. nobilis*) has the best claim to be considered the typical form of the 'Museum Ulricæ,' since of the eight figures there quoted five are habitually referred to it."

Generally speaking, however, *H. ventricosa* Lamk., which (with the smaller *H. minor* Lamk.) is the most frequent of the species, has been considered the best exponent of the Linnean *Buccinum harpa.*

Both Bruguiére (Dict., no. 9) and Dillwyn in his Catalogue, appear to attach this specific name *harpa* to nearly all the existing recent forms, treating them as numbered varieties, *e.g.* :—

Buccinum harpa L. var. *a* (Dillwyn, Catalogue, p. 607)
= *H. ventricosa* Lamk.

Buccinum harpa L. var. *b* (Dillwyn, Catalogue, p. 607)
= *H. rosea* (Klein) Lamk.

Buccinum harpa L. var. *c* (Dillwyn, Catalogue, p. 607)
= *H. nobilis* Lamk.

Buccinum harpa L. var. *d* (Dillwyn, Catalogue, p. 607)
= *H. minor* (Rumph.) Lamk.

Buccinum harpa L. var. *e* (Bruguiére, Dict., no. 9)
= *H. costata* L.

Buccinum harpa L. var. *f* (Dillwyn) = *H. articularis* Lamk.

There being a slight element of doubt, therefore, still remaining, it is perhaps best to let the specific use of *harpa* fall into desuetude and allow the well-known name *nobilis* to remain. It will be noted that Bolten uses it, which simplifies the matter considerably. All Bolten's specific names, though unaccompanied by a description, have references appended to some recognizable figure in an accredited work.

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[1] Hanley, Ipsa Linnæi Conchylia, p. 251 (1855).

[1]The following table explains this with regard to the seven species of *Harpa* recognized by him; the names in brackets are the Lamarckian by which they have till lately been generally known.

(*i.*). H. **major** Die Grosse Harfe. Gmelin, *Buccinum harpa*, sp. 47, Martini, 3 t. 119, f. 1090. Knorr, Verg., i. t. 9, f. 3, and ii. t. 8, f. 2.
[= *ventricosa* Lamk.].

(*ii.*). H. **cythara** Die Zitter, Gmel., *Buccinum harpa*, sp. 47.
[= *ventricosa* Lamk., juv.].

(*iii.*). H. **nobilis** Die edle Harfe, Gmel., *Buccinum harpa*, sp. 47, Martini, 3 t. 119, f. 1091.
[= *nobilis* Lamk.].

(*iv.*). H. **doris** Die rothe Harfe, eod. Martini, 3 t. 119, f. 1094.
[= *rosea* (Klein) Lamk.].

(*v.*). H. **amouretta** Die Harfe mit schmalen und breiten Rippen, eod. Martini, 3 t. 119, f. 1097.
[= *minor* (Rumphius) Lamk.].

(*vi.*). H. **davidis** Die David's Harfe, eod. Martini, 3 t. 119, f. 1092.
[= *articularis* Lamk.].

(*vii.*). H. **cancellata** Die schmalrippige Harfe, eod. Chemn., 10 t. 152, f. 1453.
[= *cancellata* Chemn.].

The animal of *H. ventricosa* is figured by Kiener,[2] that of *H. minor* by Quoy and Gaimard,[3] and copied by Adams.[4] Both these species are, excepting in size, exceedingly similar—the tentacles are large, eyes much developed; foot exceedingly large, and siphon long; mantle simple, with no frontal appendage. Colour a bright grey, dotted and streaked with yellow. It is reported that, being unable to withdraw entirely into their shells at the approach of danger, instances have been known of parts of the foot being at will detachable. Operculum absent. The dentition is figured by Troschel,[5] and given by Tryon[6] subsequently. No lateral teeth were observable, but the example operated upon was very young and small. There is apparent near alliance with the *Olividæ*, next which family they should be placed in sequence.

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[1] Joao Fried. Bolten, M.D., Mus. Boltenianum, pp. 149, 150. 1798.
[2] Kiener, Coq. Viv. *Harpa*, pl. 1, f. 1.
[3] Quoy and Gaimard, Voy. Astrolabe, Moll., pl. xlii., f. 5.
[4] H. and A. Adams, Gen. Rec. Moll., iii., pl. xv., f. 1.
[5] Troschel, Gebiss der Schneck., ii. t. 10, f. 1.
[6] Tryon, Man. Conch., v., p. 61, pl. ii., f. 17.

(*A*).—FOSSIL TERTIARY FORMS.

But to trace the genus to its source, it behoves us first to give a brief sketch of the fossil species, or anyhow some of the most leading of them, they being first observable in the Tertiary period, some in the Bracklesham Eocene beds, and the Barton Clay; others in the Calcaire Grossier of the Paris basin. A third series occurs in the very prolific station of Muddy Creek, Victoria, Australia. These species are of smaller size than many of the recent *Harpæ*, but bear a strong family resemblance to them.

An exception, however, exists in the old *Buccinum*[1] *stromboides* Herm., 1781, included subsequently by Lamarck in *Harpa*, till separated under the generic title *Cryptochorda* by Mörch in 1855 (*Harpopsis* Mayer, 1877). This has with some reason been disassociated from the group, and is now placed by Fischer[2] amongst the *Volutidæ*, in close proximity to the recent *Zidona angulata* Swainson, a South American Volute.

It is of medium size, ovally subfusiform, smooth and polished, with regular longitudinal occasional costæ or varices, sometimes very imperfectly developed, mouth oblong, lip simple, somewhat arched, columellar margin simple, slightly thickened.[3]

Habitat: England, in the Middle Eocene, Bracklesham beds, Sussex, Bramshaw Brook, Hants., Stubbington, and Huntingbridge.

France: Not infrequent in the Calcaire Grossier, Grignon, and vicinity of Paris.

HARPA Bolten, 1798; Lamarck, 1799.

SUB-GENUS I.—EOCITHARA P. Fischer, 1883.

H. mutica Lamarck.

H. mutica Lamarck, 1823.—Ann. de Mus., t. 2, p. 167.
„ „ „ —Recueil de Planches de Coquilles Fossiles des environs de Paris, par De la March, 1823.
„ „ „ —Deshayes, Coquilles Fossiles, p. 642, pl. lxxxvi., figs 14, 15.

Habitat: Calcaire Grossier, Grignon, Middle and Upper Eocene.

In this small species are first displayed the true characters of *Harpa*: regular longitudinal ribs, few in number, encircling the body-whorl, mouth widely oblong, spire much abbreviated. The columellar callosity is well developed.

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[1] Naturforscher, 1781, vol. xvi., p. 54, pl. ii., figs. 5, 6. Also vidé Coq. Fors., Paris, 1835, vol. ii., pl. lxxxvi., figs. 8, 10, p. 647.

[2] Paul Fischer, Man. Conchyl., 1887, p. 605.

[3] *Harpovoluta* Thiele, 1912 (Antarkt. Schneck.und Musch. in Deutsche Sud Polar Exp., 1901–3), does not seem very nearly allied; the substance is much thinner, and the body-whorl *quite* smooth and considerably inflated.

H. elegans Deshayes.

Harpa elegans Desh., Coq. Fossiles, p. 643. pl. lxxxvi., figs. 16–18.

Habitat: Upper Eocene, 'les sables moyens.' Bartonian.

The ribs are more frequent than in the last species.

H. lamellifera Tate.

Harpa lamellifera R. Tate, Trans. Roy. Soc. S. Australia, xi., p. 149, pl. vi., fig. 2, 1889.

„ „ G. F. Harris, Cat. Tert. Moll., Dept. Geol. Brit. Mus. Nat. Hist., pp. 78 sqq., 1897.

Habitat: Eocene, Muddy Creek, Victoria, Australia.

A species with thin elevated lamellæ.

H. sulcosa Tate.

Harpa sulcosa R. Tate, l.c., p. 150, pl. vi., f. 10, 1889.

„ „ G. F. Harris, l.c.

Habitat: Eocene, with the preceding.

Distinguished by flat area bordering suture. Lamellæ very close together, exceedingly thin. Columellar callosity distinct.

H. tenuis Tate.

Harpa tenuis R. Tate, l.c., p. 151, pl. vi., f. 1, 1889.

„ „ G. F. Harris, l.c.

A larger species, proportionately speaking, well developed, with fewer longitudinal lamellæ than the last species, with which it occurs at Muddy Creek.

H. abbreviata Tate.

Harpa abbreviata R. Tate, l.c., p. 150, pl. vi., f. 7, 1889.

„ „ G. F. Harris, l.c.

Habitat: Eocene, with the last three species. Most allied to *H. tenuis*. It is a much inflated shell, abbreviate, but delicate.

SUB-GENUS II.—SILIA Mayer,[1] 1877.

The type *Harpa zitteli* Mayer found in the Eocene is distinguished by the simple suture. It is rare and peculiar.

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[1] Mayer-Eymar, Beitrage Geol. Karte Schweig, Lief. xiv. (1877).

(*B*).—RECENT FORMS.

1.—Harpa costata L.

Buccinum costatum Linnæus, Syst. Nat., x., p. 738; xii., p. 1202.
" " Gmelin, p. 3482.
Buccinum costatum Mawe, Linn., Syst. Conch., p. 119, frontispiece, f. 4, 1823.
Buccinum harpa e Bruguiére, Dict., no. 9.
Buccinum imperiale Chemnitz, taf. 66, figs. 1, 2, taf. 70, f. 1.
" " Martini, Conch. Cab., iii., t. 119, f. 1093.
Harpa imperialis Lamarck, An. Sans Vert., vii., 1, ed. x., p. 129.
" " Reeve, Conch. Syst., ii., p. 226, pl. 263, f. 1.
" " Reeve, Conch. Icon., *Harpa*, no. 5, t. 2, f. 5.
Harpa costata L., Sowerby, Thes. Conch., iii., p. 169, figs. 4, 5, 23.
Harpa ventricosa Lamarck, var., L. C. Kiener, Coq. Viv. Purp., i., p. 7, pl. ii., f. 2.

Habitat: Mauritius.

This most beautiful and still uncommon species is undoubtedly the *Buccinum costatum* L., as proved by the examination by Mr. Sylvanus Hanley of the actual Linnean specimens (Ipsa Linnæi Conchylia, p. 251). It appears that upon first publishing this as a species the illustrious author felt so doubtful of its real distinctness that he placed it in the tenth edition of his 'Systema,' with a cypher attached, between nos. 400 and 401. Although the description is insufficient, the ribs are mentioned as 'confertis,' crowded, and this points to the correctness of the identification.

It is indeed strange that Kiener did not sufficiently understand this fine shell, but followed certain of his forerunners in blindly merging it with *H. ventricosa*. *H. costata* is somewhat rotund in outline, of light painting typically, the larger well-developed examples being usually of a pale fawn colour, tinged with carneous; ribs thin, smooth, sometimes very closely overlapping, more distant in some varieties, in number 21–35, or even over 40. I may here mention that the specimen figured in Reeve's Conch. Icon., vol. i. (1843) as being in the collection of the Rev. Francis J. Stainforth, has been for twenty years or more in my possession. He was a friend of many members of my family, and had presented this specimen to my cousin, Miss Augusta Hardcastle, of Brighton, who generously bequeathed it to my care. This is supposed to be one of, if not the most perfect example known to exist, and to possess the maximum number of ribs. It is not, however, equal in colour to the very beautiful examples in our National Collection, noteworthy both in form, colour, and elegance.

Two varieties have been named of this species:—

(*a*) *multicostata* Sowerby, Gen. of Shells, p. 1.

(*b*) *grunneri* Maltzan, MS., A. Sutor, Jahrbuch Mal. Gesellsch., iv., 1877, t. 4, f. 2.

Both these are many-ridged varieties; the latter is distinguished by its author by having "ausserordentlich zahlreiche und dabei ganz scharfen Rippen."

(*c*) var. **lætifica** nov.

A dwarf race, with fewer ribs, never overlapping, ribs more brightly coloured, fawn-carnation, flattened, shining, about ten in number dorsally, the transverse bands well defined and darker, interstices plain.

Long., 45 mm.; lat., 29 mm.

Hab. ?

I have at various times seen a fair series of this small, fewer-ribbed, dwarf form, and consider it nearly if not quite full grown. It is well figured in Reeve's Conch. Icon., vol. i., *Harpa*, pl. i., f. 2d; and also in Sowerby, Thes. Conch., pl. 233, fig. 23.

2.—**Harpa major** Bolten.

Harpa major Bolten, 1798, Mus. Bolt., p. 149, no. 1872.
? *Buccinum harpa* Linn., Syst. Nat., x., p. 738; xii., p. 1201.
„ „ Gmelin, p. 3482.
„ „ Martini, Conch. Cab., iii., t. 119, f. 109.
„ „ var. α Dillwyn, Cat. ii., p. 207.
„ „ var. α Bruguiére, Dict., no. 9.
Harpa ventricosa Lamarck, An. Sans Vert., vii., p. 255.
„ „ Deshayes, Encycl. Méthod., ii., p. 185.
„ „ Kiener, Coq. Viv., Purp., i., p. 7, pl. i., figs. 1, 1a.
„ „ Tryon, Man. Conch., v., p. 98, pl. $\overset{40}{x2}$, fig. 59, 60.

Habitat: Eastern tropics, Mauritius; Persian Gulf, very rare, F. W. Townsend; Philippine Isles to N. and N.W. Australia.

This most well known and frequent species would in a common-sense purview be taken as the type of *B. harpa* L. But, though Mr. Hanley succeeded to his own satisfaction in weighing the probabilities in favour of *nobilis*, a more uncommon species, I still think sufficient element of doubt remains—a doubt shared by nearly all who have written on the subject—which should prevent this name being pressed forward as the specific term to be used for either *ventricosa*, *minor*, or *nobilis*. Under these circumstances, the Boltenian name *major* has precedence by one year over the better known and more appropriate *ventricosa*.

On May 11th, 1869, at Stevens' Auction Rooms, in King Street, Covent Garden, was sold the first portion of the late Mr. G. F. Angas' celebrated collection of Mollusca (sale no. 3186). Lot 92 was catalogued thus :—

> "Two white variety of *Harpa ventricosa*, and a beautiful rose-"tinted one."

I was present on this occasion, and shall never forget the beauty of these shells. Two of them were of the purest white, perfect albinos, live, shining, and polished, the third very finely tinted with rose. They were purchased by my friend, the late Mr. Allan Harvey Drummond, for Lady Harriet Ramsden, who then lived in Portman Square, and possessed a very select conchological cabinet. She died in November, 1873, and her collections were dispersed; but I have never been able to trace these wonderful shells, which live in one's memory as perfect.

I esteem *H. cabritii* Fischer (*J. de Conch.*, viii., pl. iv., f. 1, 2) to be a dwarf, compact form of this species, with the callous columellar deposit not sufficiently thickened so as to modify the many ribs of the earlier whorls. It is a very beautiful form, and I possess two fine specimens.

3.—**Harpa conoidalis** Lamarck.

Harpa conoidalis Lamarck, Anim. Sans Vert., vii., p. 255, no. 3.
" " Reeve, Conch. Icon. *Harpa*, no. 7, pt. iii., f. 7.
Harpa ventricosa Lamk. var. L. C. Kiener, Coq. Viv., p. 6, pl. v., f. 4.
Harpa ventricosa var. δ Deshayes, Encycl. Méth., Vers, ii., p. 186.
Harpa conoidalis Lamk., Tryon, Man. Conch., v., p. 98, pl. xl., f. 61.
Habitat : Philippine Islands, Mauritius, Indian Ocean generally.

Confounded with *ventricosa* Lamk., till that author finally differentiated it, this species differs in greater obliquity of whorl, and sloping crescent-shaped outer lip. Substance lighter, with callous deposit of columellar enamel less pronounced. Character of painting variable. Ribs almost as in *ventricosa* in painting, but thinner and less pronounced as a rule, never overlapping, shining, carneous.

This species certainly seems a link between *ventricosa* (*major*) and *articularis* (*davidis*), possessing attributes of both. All the so-called *conoidalis*, with decided revolving articulated markings on the ribs, I should call *articularis*. Typical *conoidalis* is, as regards its costal painting, very similar to *ventricosa*. I consider *nablium* Mart. and *ligata* Menke, therefore, to belong to the next species.

(*To be continued*).

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NOTES ON THE GENUS HARPA.[1]

(Concluded from p. 32).

BY JAMES COSMO MELVILL, M.A., D.SC.

(Read before the Society, 10th March, 1915).

4.—Harpa davidis Bolten.

Harpa davidis Bolten, Mus. Boltenianum, p. 150 (1798).
Harpa articularis Lamk., Anim. Sans Vert., vii., p. 256, no. 5.
Harpa ventricosa Lamk. β Desh., Encycl. Method., Vers, ii., p. 186.
Harpa articularis Kiener, Coq. Viv., p. 8, no. 2, t. 2, f. 3.
" " Reeve, Conch. Icon., no. 4, pl. ii., f. 4.
" " Sowb., Thes. Conch., iii., t. 232, f. 20, 22.
Harpa conoidalis Lamk. var. Tryon, Man. Conch., v., p. 98, f. 62.
Harpa nablium Martini, Conch. Cab., iii., f. 1092.
Harpa ligata Menke, A. Sutor, Jahrb. Malak. Gesell., iv., 107, 1877.
Habitat: Indian Ocean, Philippines, Mauritius, Moluccas.

Bolten refers to the figure in Martini, Conch. Cab., iii., t. 119, f. 1092, leaving no doubt as to the species intended by his *davidis*,[1] which name has priority. This species is by many authors now considered a variety only of the last (*conoidalis*), but differs in the painting mainly of the ribs. These are transversely conspicuously articulated with clear dark lines. Form much the same as *conoidalis*.

I take *H. nablium* Mart. = *Bucc. antiquatum* Chemn. to be a fine variety, broadly transversely banded on the thickened longitudinal costæ. I have one example of this species, though not so pronounced in marking as fig. 14 in Sowerby's Thes. Conch.

H. ligata Menke, allowed as a species by Dr. Aug. Sutor, seems intermediate between *nablium* and *articularis* type.

5.—Harpa nobilis (Rumph.) Bolten.

Harpa nobilis Rumphius, Mus. t. 32, f. L, 1705.
Harpa nobilis Martini, Conch. Cab., iii., t. 119, f. 1091.

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[1] I presume the name now to be adopted was given in honour of the harp of King David.

Harpa nobilis Bolten, Mus. Bolt., p. 150, no. 1875.
Buccinum harpa var. *e* Dillwyn, Cat. 2, p. 607.
Buccinum harpa var. *c* Bruguiére, Dict. no. 9.
Harpa nobilis Lamarck, Anim. Sans Vert., vii., p. 256.
„ „ Deshayes, Encycl. Méthod. Vers, ii., p. 186.
„ „ Kiener, Coq. Viv. *Harpa*, p. 9, pl. iii., f. 5.
„ „ Reeve, Conch. Icon. *Harpa*, pl. i., f. 1.
„ „ Sowerby, Thes. Conch., iii., p. 170, f. 1, 2, 3.
„ „ Tryon, Man. Conch., v., p. 99, pl. xli., f. 68.

Habitat: Philippine Isles; Ticao, Sarangani, Zamboanga and Surigao in Mindanao (Hidalgo).

A compact and pretty species of a very uniform and decided pattern. It is not prone to vary. It never attains as large a size as *costata*, *ventricosa*, or *conoidalis*, and is remarkable for irregular square transverse blotches of Indian red, disposed on the centre of the body-whorl, and also towards the sutures, and the interrupted thin clearly-marked transverse lines on the ribs. It is uniformly polished, and inclined to be incrassate. I have already alluded to the identification of this by Mr. S. Hanley as the original *Buccinum harpa* L.

6.—**Harpa crenata** Swainson.

Harpa crenata Swainson, Bligh Cat., App. 3.
„ „ Reeve, Conch. Icon. *Harpa*, no. 9, pl. iv., f. 9.
Harpa rivoliana Lesson., Illustr. Zool., t. 36.
„ „ Sowerby, Thes. Conch., iii., p. 171, pl. 232, f. 12, 13.
Harpa crenata Swainson, Tryon, Man. Conch., v., p. 98, pl. xl., f. 65.

Habitat: Acapulco, Mexico, Panama, and other stations on Central American coasts.

The only species of the New World. A link between *conoidalis* and *rosea*. From the latter, to which it is most akin, it differs in its livid-grey colour, with spire less produced, and ribs often almost submersed. It is frequently somewhat distorted, when the costæ appear flattened and irregular.

7.—**Harpa doris** Bolten.

Harpa doris Bolten, Mus. Bolt., p. 150, no. 1876.
Cithara rosea Klein, Ostracol., t. vi., f. 104.
Harpa rosacea Martini, Conch. Cab., iii., t. 119, f. 1094.
Buccinum harpa var. *b*, Bruguiére, Dict. no. 9.
Buccinum harpa var. *B*, Dillwyn, Cat. ii., p. 107, no. 48.
Buccinum roseum Wood, Ind. Test., t. iv., f. 23.

Harpa rosea Lamarck, Anim. Sans Vert., vii., p. 256.
,, ,, Deshayes, Encycl. Méthod.; t. 404, f. 2.
,, ,, Kiener, p. 11, no. 5, pl. v., f. 8, 8a.
,, ,, Reeve, Conch. Icon. *Harpa*, no. 8, pl. iv., f. 8 a–d.
,, ,, Sowerby, Thes. Conch., iii., p. 171, pl. 231, f. 6–8.
,, ,, Tryon, Man. Conch., p. 99, pl. xl., f. 66, 67.

Habitat: Guinea, Senegal, West Africa.

It is a matter for great regret that so expressive a name as *rosea* should fall, and a meaningless almost 'nomen nudum' take its place. This most elegant species is the brightest coloured of all the *Harpæ*, allied to *crenata* Sw., as just noticed, and conspicuous for its very light build, produced spire, and suffusion of rose over the whole surface. One very beautiful variety has two transverse dark bands on the body-whorl, contrasting with the colouration on the ribs and the rest of the shell.

8.—**Harpa gracilis** Brod. and Sow.

Harpa gracilis Broderip and Sowerby, Zool. Journ., iv., p. 373.
,, ,, Reeve, Conch. Icon. *Harpa*, pl. ii., f. 3 a, b.
,, ,, Sowerby, Thes. Conch., iii., p. 171, pl. 233, f. 32, 33.
,, ,, Tryon, Man. Conch., v., p. 99, pl. xli., f. 73.

Habitat: Paumotus Is., Annaa Is.; Society Isles; Philippines (Hidalgo).

Much allied to the next (*H. minor*), but altogether of considerably lighter build, and in that respect assimilating *H. rosea* (*doris*). It has never been questioned as a species, and accordingly I have given it its usual rank; but it might be a variety of the next, as remote on the one hand from the type as, on the other, is *H. crassa* Mörch = *solidula* A. Ad., which I will refer to immediately. *H. gracilis* is more elongate than *minor*, the painting suffused and rather indistinct, sometimes rosy, but often dull drab or livid.

9.—**Harpa minor** (Rumph). Lam.

Harpa minor Rumphius, Mus., t. 32, f. M., 1705.
,, ,, Martini, Conch. Cab., iv., t. 119, f. 1097.
Buccinum harpa var. *D*, Dillwyn, Cat. ii., p. 607.
Buccinum harpa var. *D*, Bruguiére, Dict., no. 9.
Harpa amouretta Bolten, Mus. Bolt., p. 150, no. 1877.
Harpa minor Lamarck, Anim. Sans Vert., vii., p. 557.
,, ,, Deshayes, Encycl. Méthod. Vers, ii., p. 187, no. 3.
,, ,, Quoy and Gaimard, Voy. de l'Astrolabe, Zool., ii., p. 620, t. xlii., f. 5–7.
,, ,, L. C. Kiener, *Harpa*, p. 10, pl. iv., f. 6, 6a.

Harpa minor Tryon, Man. Conch., v., p. 99, pl. xli., f. 69–72, 78.
„ *crassa* Philippi, Mörch, Yoldi Cat., 125.
„ *solidula* A. Adams, P.Z.S. London, 1853, p. 173.

Habitat: Indian Ocean, Madagascar, Mauritius (and var. *crassa*), Fiji Islands, South Africa, Japan, Kudaka Island, Loochoo (Stearns).

A very common species, dull in hue, the smallest of the genus, though occasionally of fair size. The largest I possess measures 55 mm., the smallest 32 mm. Uniformly narrow in shape, with elevated spire, in marking it bears similitude to *H. nobilis*, the square body-whorl blotches being dull cinereous in this species instead of the bright Indian red of *nobilis*, and the transverse lines on the narrow ribs are almost identical. A variety is *H. crassa* Mörch, considered by Sowerby (Thes. Conch., p. 171, pl. 233, f. 30, 31) a species; it is brighter coloured, and much thickened, and broader, angled in the upper part of the costæ. Of this I have also an albino variety, under name of *solidula* A. Adams.

The unique specimen of *H. virginalis* J. Gray,[1] admitted also by Sowerby as a species, seems to belong here. It is an albino, with intercostal riblets, quite regularly arranged. It is impossible to judge of its merit without seeing the type.

The name *amouretta* Bolten is not classical, but a French colloquial appellation. I therefore discard it as barbarous.

10.—**Harpa cancellata** Chemnitz.

Harpa cancellata Chemnitz, Conch. Cab., xviii., p. 186, t. 152, f. 1453.
„ „ Martini and Chemnitz, Syst. Conch. Cab. (Küster); taf. lxx., f. 4, 5.
„ „ Sowerby, Thes. Conch., iii., p. 170, pl. 233, f. 26.
„ „ Tryon, Man. Conch., v., p. 99, pl. xli., f. 74–77.
„ *striata* Lamarck, Hist. Nat., x., p. 133.

Habitat: Mauritius; Zambales, Philippines (Hidalgo).

Described by Sowerby as being unique in the collection of Mr. Hanley. This species is noted for the thin ribs, moderate size, and fine spiral cancellations in the interstices between the ribs of the body whorl. The ribs are distant. It is very probably the young of one of the better-known species, but has been deemed by nearly all past writers on the genus to possess good distinctive qualities, the cancellations just mentioned being especially thus considered. Tryon, indeed, makes *H. striatula* Ad. synonymous. This is usually supposed to be the juvenile condition of *H. ventricosa*.

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[1] Sowerby, Thes. Conch., *Harpa*, p. 172, pl. 233, f. 34, 35.

11.—**Harpa punctata** Verco.

Harpa punctata Verco, Trans. Roy. Soc. S. Australia, 1896, p. 218, pl. vi., f. 3, 3a, 3b.

Habitat: Two recent and two broken, at 20 fathoms, Newland Head. One dead and one broken, 22 fathoms, Backstair Passage, Australia.

The only recent species added of late years, and distinguished by its distant ribs and dotted ornamentation, rendering it most distinct. In form it resembles the tertiary *H. mutica*, and Dr. Verco has lately placed it in the sub-genus *Eocithara*, to which most of the fossil forms appertain.

H. ventricosa and *H. minor* Lamk. are noted as Australian species likewise, ranging from the north to north-west of that continent.

Note.—*Harpa costata* (L.) var. *lætifica*: It has been pointed out to me by Mr. J. M. Williams, of Liverpool, who was kind enough to forward a very fine beautifully coloured specimen of the above variety, that no mention was made of the thin, very acute, undeveloped riblets longitudinally running between the costæ, in the exact centre of each interstice.

CATALOGUES AND MONOGRAPHS OF THE GENUS.

Harpa has been monographed, so far as its recent species are concerned, by Martini and Chemnitz, Lovell Reeve, L. C. Kiener, G. B. Sowerby, August Sutor, and George W. Tryon, jun. It will, perhaps, be of interest to give the species named by each, which demonstrates the doubt that has existed amongst experts since the time of Linnæus, as to their limitation. I also give Lists from Agnes Catlow's Conchologists' Nomenclator; F. Paetel, Catalog der Conchylien Sammlung; and J. G. Hidalgo, Cat. Moll. Test. de las Ins. Filipinas (1904–5).

I.—Martini and Chemnitz, "Conchylien Cabinet," Ed. Küster, Nürnberg, 1857, admit ten species of *Harpa*:—

Harpa articularis Lamk.,
„ *cancellata* Chem.,
„ *conoidalis* Lamk.,
„ *crenata* Swains.,
„ *gracilis* Br. and Sow.,
Harpa imperialis Chem.,
„ *minor* (Rumph.) Lamk.,
„ *nobilis* Lamk.,
„ *rosea* Klein,
„ *ventricosa* Lamk.

II.—Lovell Augustus Reeve in "Conchologia Iconica," vol. i., 1843, gives nine species:—

Harpa articularis Lamk.,
„ *conoidalis* Lamk.,
„ *crenata* Swains.,
„ *gracilis* Brod. and Sow.,
„ *imperialis* Chem.,
[= *costata* L.],
Harpa minor Rumph.,
„ *nobilis* Lamk.,
„ *rosea* Klein,
„ *ventricosa* Lamk.

III.—Lovell Reeve in the "Conchologists' Nomenclator," 1845, p. 275, by Agnes Catlow, gives the following nine species:—

Harpa articularis Lamk.
[=*ventricosa* var. Desh.],
„ *conoidalis* Lamk.,
„ *crenata* Swains.
[=*rosea* var. Gray],
„ *gracilis* Broderip
[=*minor* var. Gray],

Harpa imperialis Chem.
[=*Bucc. costatum* in pte.
„ *minor* Rumph., Linn].
„ *nobilis* Rumph.,
„ *rosea* Lamk.
[=*H. rosacea* Martini],
„ *ventricosa* Lamk.

IV.—L. C. Kiener, Coquilles Vivantes, "*Harpa*," 1842, admits five species:—

Harpa articularis Lamk.,
„ *minor* Lamk.,
„ *nobilis* Lamk.,

Harpa rosea[1] Lamk.,
„ *ventricosa*[2] Lamk.

V.—G. B. Sowerby in the "Thesaurus Conchyliorum," iii., pp. 169–172, 1866, admits the following twelve species:—

Harpa articularis Lamk.,
„ *cancellata* Chem.,
„ *costata* L.,
„ *crassa* Mörch,
„ *gracilis* Brod.,
„ *minor* Rumph.,
„ *nablium* Mart.
[=*conoidalis* Lamk.],

Harpa nobilis Rumph.,
„ *rivoliana* Lesson
[=*crenata* Swains.],
„ *rosea* Klein,
„ *ventricosa* Lamk.,
„ *virginalis* J. Gray.

VI.—Dr. Aug. Sutor[3] monographed the genus in 1877, including the following sixteen as true species:—

Harpa articularis Lamk.,
„ *cabritii* Fischer,
„ *cancellata* Chem.,
„ *conoidalis* Lamk.,
„ *costata* L.
[=*imperialis* Chem.],
„ *crassa* Phil.
[=*solidula* A. Ad.],
„ *crenata* Swains.,
„ *gracilis* Brod.,

Harpa ligata Menke,
„ *minor* Lamk.,
„ *nablium* (Mart.)
var. *striatula* juv.,
„ *nobilis* Lamk.,
„ *rosea* Lamk.,
„ *striata* Lamk.,
„ *ventricosa* Lamk.,
„ *virginalis* J. Gray.

VII.—Tryon, "Manual of Conchology," vol. v., p. 98 (1883) gives descriptions of the following, admitting nine species and six varieties:—

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[1] With *H. rivoliana* Lesson = *crenata* Swains.

[2] Inclusive of *H. costata* L. and *conoidalis* Lamk.

[3] A. Sutor, Jahrb. Malak. Gesell., pp. 97-129, pl. 4, 5, 1877.

Harpa conoidalis Lamk.,
v. *articularis* Lamk.,
v. *ligata* Menke
[=*nablium* Martini]
forma *striatula* juv.,
„ *costata* L.,
„ *crenata* Swains.,
„ *gracilis* Brod. and Sowb.,
„ *minor* Lamk.

v. *crassa* Phil.,
v. *solidula* A. Ad.,
v. *virginalis* J. Gray,
Harpa nobilis Lamk.,
„ *rosea* Lamk.,
„ *striata* Lamk.
[=*cancellata* Chem.],
[=*cabritii* Fischer],
„ *ventricosa* Lamk.

VIII.—Paetel[1] admits fifteen species and two varieties:—

Harpa articularis Lamk.,
„ *cabritii* Fischer,
„ *cancellata* Chem.,
„ *conoidalis* Lamk.,
„ *costata* L.
[=*imperialis* Chem.],
„ *crenata* Swains.,
v. *testudinalis* Lamk.,
„ *gracilis* Brod.,

Harpa gruneri Crosse,
„ *major* Mart.,
„ *minor* Rumph.,
v. *crassa* Phil.,
„ *nobilis* Rumph.,
„ *rosea* Lamk.,
„ *striata* Lamk.,
„ *striatula* A. Ad.,
„ *ventricosa* Lamk.

IX.—Hidalgo[2] signalizes the following from the Philippine and Marianne Islands:—

Harpa articularis Lamk.,
„ *conoidalis* Lamk.,
„ *crassa* Phil.,
„ *ligata* Menke,

Harpa minor Lamk.,
„ *nobilis* Lamk.,
„ *ventricosa* Lamk.,

and adds the following as probably occurring:—

Harpa cancellata Chem.,
„ *gracilis* Brod.,

Harpa nablium Sowb.,
„ *striata* Lamk.

(*costata* (L.) being the chief absentee, besides, naturally, the West American *crenata* Swains.).

SUMMARY OF THE FOREGOING NINE TABLES.

Admitted as species in nine:—

Harpa minor Lamk.,
„ *nobilis* Lamk.,

Harpa ventricosa Lamk.

Admitted as species in eight:—

Harpa articularis Lamk.,
„ *conoidalis* Lamk.,

Harpa gracilis Brod. and Sowb.,
„ *rosea* Lamk.

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[1] Cat. der Conchylien Sammlung von Fr. Paetel, Berlin, 1887.

[2] J. G. Hidalgo, Cat. Moll. Test. de las Ins. Filipinas, Joló y Marianas, pp. 85, 86, Madrid, 1904, 1906.

Admitted as species in seven:—
Harpa costata (L.),
Harpa crenata Swains.

Admitted as species in six:—
Harpa cancellata Chem.

Admitted as species in three:—
Harpa crassa Mörch,
Harpa striata Lamk.

Admitted as species in two:—
Harpa cabritii Fischer,
„ *ligata* Menke,
Harpa nablium Martini,
„ *virginalis* J. Gray.

* * * * *

These following names do not appear in the foregoing Catalogues:—
Harpa crenato-rosea Gray = *crenata* Swains.
„ *mexicana* "Auct." Reeve, C. Icon., sp. 9 = *crenata* Swains.
„ *oblonga* Schum. = *minor* Lamk.
„ *punctata* Verco: not described till 1896.
„ *rosea* Kiener, t. 5, f. 8, 8a = *crenata* Swains.?
„ *rosacea* Martini = *rosea* Kien.?
„ *testudinalis* "Auct." Reeve, C. Icon., sp. 9 = *crenata* Swains.

Finally, George Perry[1] has described three species:—

1. *Harpa grandiformis* = ? *conoidalis* Lamk.
2. „ *delicata* = ? *articularis* Lamk. juv.
3. „ *urniformis* var. monstr. *incertæ sedis*.

The figure of No. 1 is fairly good; of Nos. 2 and 3 very fantastic and specious, all impossible to determine with absolute certainty.

NOTE.—I may add that an exhaustive article on the anatomy of the genus, entitled "Beitrag zur Kentniss der Gattung *Harpa*," by Dr. R. Bergh, was published in 1901.[2]

And, with regard to the fossil forms, the "Essais de Paleontologie Comparée," by M. Cossmann, 1899, livr. iii., pp. 72–79, contain an extended account of the various species, of which only a selection was given in the first portion of this paper, Dr. Tate and others having added many in more recent years to our lists.

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[1] G. Perry. "Conchology, or the Natural History of Shells." W. Miller, Albemarle Street, London, 1811. Pl. xl., figs. 1, 2, 3.

[2] Zool. Jahrbuch Anat., xiv., pp. 609—629, pl. xlvii. (1901).

FURTHER NOTES ON BURSA RUBETA L.

By CHARLES HEDLEY.

(Read before the Society, October 16th, 1915).

So intricate was the web which error and repetition had wrapped round the name of *Murex lampas* that for a century and a half the identity of that Linnean species was lost. Mr. E. A. Smith has lately succeeded in showing that this name originally covered at least two species and that it should be restricted to the Lamarckian *Triton nodiferum*. For the residue he established *Bursa rubeta* with several varieties.[1]

Commenting on this classification, Mr. E. G. Vanatta[2] suggested that *Bursa rubeta* as thus presented by Mr. Smith comprised three species, and that the species name should date from 1758 rather than from 1798.

The two Linnean names concerned in this matter, ***bubo*** and ***rubeta***, depend on the figures of Rumphius. From the uncharacteristic dorsal view presented by the Dutch engraving either figure might refer to any of the *rubeta* group. But Rumphius says that his *Buccinea tuberosa* has "the inside white like porcelain," and this, supported by the large size, seems to fix *Murex rana* var. *bubo* Linn. definitely as *Bursa rubeta* var. *gigantea* Smith. It was said by Férussac (Tabl. Syst., 1821, p. 73) that the collection of Rumphius was preserved at Amsterdam. If it is still there this point may yet be verified. I have seen this species from Gela, Solomon Islands. For the *Murex rana* var. *rubeta* Linn. we may be content to accept Bolten's rendering as endorsed by Mörch and Smith.

But Bolten's *Tritonium bufo* seems to be distinct from *bubo* Linné and to be identical with *B. rubeta* var. *lissostoma* Smith. This species I have collected at Lord Howe Island, and seen from Noumea, New Caledonia. It is probably that which Angas has recorded[3] from the Macleay River, N.S. Wales.

For these reasons it is proposed to resolve the *Bursa rubeta* complex into the following four species :—

Bursa rubeta Linné.

Buccinea tuberosa rufa Rumphius : *Murex rana rubeta* Linn. Syst. Nat. x., 1758, p. 748 and *Murex lampas rubeta* Linn. Syst. Nat. xii., 1767, p. 1216, both for Rumphius Rariteitkamer, 1741, p. 95, pl. xxviii., fig. D; *Tritonium tuberosum* Bolten, Mus. Bolt. (2), 1798,

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[1] Smith, *Journ. of Conch.*, xiv., 1914, pp. 226–231.

[2] Vanatta, *Nautilus*, xxviii., 1914, p. 80.

[3] Angas, Proc. Zool. Soc., 1877, p. 179.

p. 127, *T. rubeta* Bolten, op. cit., p. 128; *Lampas hians* Schumacher, Essai Nouv. Syst., 1817, p. 252; *Lampas rubeta* Mörch, Cat. Yoldi Coll., 1852, p. 106, and Hanley, Ips. Linn. Conch., 1855, p. 286, all for Chemnitz, Conch. Cab., iv., 1770, p. 83, pl. 128, fig. 1236, 1237.

Triton lampas Bruguière, Encycl. Meth. Vers., 1816, pl. 420, fig. 3, a, b.

Tutufa caledonensis Jousseaume, Bull. Soc. Zool. France, xvi., 1881, p. 175.

Bursa rubeta, typical, Smith, *Journ. of Conch.*, xiv., 1914, p. 229, pl. 4, fig. 1, 2.

Bursa rubeta Vanatta, *Nautilus*, xxviii., 1914, p. 80.

Bursa bubo Linné.

Buccinea tuberosa Rumphius; *Buccinum majus*, etc., Gualtieri, Index Test. Conch., 1742, pl. 50, fig. D; *Murex rana bubo* Linné and *M. lampas* (in part), Syst. Nat., x., 1758, p. 748; *Murex lampas bubo* Linné, Syst. Nat., xii., 1767, p. 1212, both for Rumphius Rariteitkamer, 1741, p. 95, pl. xxviii., fig. C.

Triton lampas Reeve, Conch. Icon., ii., 1844, pl. ix., fig. 30a.

Bursa rubeta var. *gigantea* Smith, *Journ. of Conch.*, xiv., 1914, p. 230, pl. 4, fig. 4, 5.

Bursa bubo Vanatta, *Nautilus*, xxviii., 1914, p. 80.

Bursa bufo Bolten.

Tritonium bufo Bolten, Mus. Bolt. (2), 1798, p. 128, for Chemnitz, Conch. Cab., iv., 1770, p. 83, pl. 129, fig. 1238.

Triton lampas Blainville, Man. de Malac., 1825, p. 400, pl. 18, fig. 1; Id., Kiener, Coq. Viv. Triton, 1842, p. 38, pl. v., i.; Id., Reeve, Conch. Icon., ii., 1844, pl. 10, fig. 306.

Tritonium lampas var. Dunker, Index Moll. Mar. Jap., 1882, p. 31.

Bursa rubeta var. *lissostoma* Smith, *Journ. of Conch.*, xiv., 1914, p. 230, pl. 4, fig. 3.

Bursa tenuigranosa Smith.

Bursa rubeta var. *tenuigranosa* Smith, *Journ. of Conch.*, xiv., 1914, p. 231, pl. iv., fig. 6.

Bursa tenuigranosa Vanatta, *Nautilus*, xxviii., 1914, p. 80.

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Tree-climbing by Helicella caperata (Mont.).—I was greatly surprised to see a number of *H. caperata* (Mont.) climbing up a beech tree, near Guildford, last September. Some were at least ten feet up the trunk, others just starting on their upward journey. Is it not very unusual for this geophilous species to take to an arboreal existence? In the neighbourhood of Paignton, S. Devon, I have noted *Helix hortensis*, *H. aspersa*, *H. virgata* and *Hyg. rufescens* several feet up the trunks of pine trees, which would seem to be generally avoided by all molluscs.—NORMAN G. HADDEN (*Read before the Society*, Nov. 10th, 1915).

NOTES ON MARGINELLA.

By J. R. le B. TOMLIN, M.A.

(Read before the Society, January 12th, 1916).

Marginella seminula Dall, Bull. Mus. Comp. Zool., Harvard, ix., p. 72 (1881); ibid., xviii., p. 139, pl. 19, f. 2.

This name, given to a deep-water species from Yucatan Strait, 640 f., is preoccupied by *M. seminula* Gould, Proc. Bost. Soc. N.H., vol. vii., p. 384 (1861), from False Bay, Cape of Good Hope. I, therefore, rename it *Marginella abyssorum.*

Marginella glauca Jousseaume, Guérin's Rev. et Mag. de Zool., 1875, p. 234, pl. 8, f. 1.

Preoccupied by *M. glauca* G. Fischer, Mus. Demidoff, tom. iii., p. 172 (1807).

I think it is very doubtful whether Jousseaume's shell is anything more than a form of *M. quinqueplicata* Lam., but, if necessary, the name [1]*M. loebbeckeana* Weinkauff, applied to the same form, is available.

Jousseaume gives no locality for his shell, but Weinkauff quotes Singapore (Cuming), Ostafrika, Nicobaren, Ceylon (Reeve). It is a common shell at Singapore, where *M. quinqueplicata* Lam. is also abundant.

Marginella ventricosa Hedley, Memoirs of the Australian Museum, iv., pt. 6, p. 369 (1903)—new name for *M. ovulæformis* Tate and May.

There is already [2]*M. ventricosa* G. Fischer and [3]*M. ventricosa* Hutton, so I propose to call Tate and May's and Hedley's species *M. bucca*, and Hutton's fossil species *M. fracta.*

The full description of Fischer's shell is as follows:—"Marginella bossue, bleuâtre, ventrue; la spire très courte, la columelle à cinq plis, la lèvre fortement bourrelée, lisse. La patrie est inconnue."

There can be very little doubt that this applies to *M. quinqueplicata* Lam.—a name which *M. ventricosa* Fischer antedates by 15 years.

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[1] Syst. Conch. Cab., *Marginella*, p. 33, pl. 5, f. 9, 12 (1878).

[2] Mus. Demidoff. tom. iii., p. 172 (1807).

[3] Cat. Tertiary Moll. N.Z., p. 8 (1873).

ADDITIONS TO "BRITISH CONCHOLOGY."

By J. T. MARSHALL.

PART VII. (*continued from vol. 14, p. 329*).

Littorina littorea L.—

var. **brevicula** Jeff.—There is little difference in the adult stage between this and the var. *paupercula*, though it is more apparent in the young. A globular form of the type also resembles this variety.

var. **elegans** S. Wood, Crag Moll., vol. i., p. 118, tab. x., fig. 14d. —This name is prior to that of var. *turrita* Jeff., conferred on the same shell.

var. **antiqua** S. Wood, Crag Moll., vol. i., p. 118, tab. x., fig. 14a. —In this variety the spire is abnormally elongated, and it has the same length and breadth as var. *elegans*, but the whorls are compressed instead of scalariform. Found by Mr. James Simpson in the Ythan estuary, Aberdeen; not uncommon.

monst. **sinistrorsum** Jeff.—A reversed specimen has been recorded by M. Dautzenberg,[1] which he considered to be unique; but the Jeffreys' collection contained three, and I know of one other, though none have been discovered in recent years. Gwyn Jeffreys has recorded two examples which he obtained from Billingsgate market,[2] and having subsequently heard of a third he proceeded to the market and offered 5/- for it, but the possessor held out for 7/6, which Jeffreys refused to give. This came to the knowledge of Mr. Rich, a dealer, who acquired it for 7/6 and promptly sold it to Mr. Leckenby for £5. The fourth was found by another Billingsgate salesman in a casual way, and came to the knowledge of Mr. Baxter, the chief merchant in Billingsgate, who was an old friend of Gwyn Jeffreys, and was indebted to him for some valuable advice as a co-shareholder on the failure of the Albert Insurance Co. Mr. Baxter, after some haggling with the possessor, secured the prize for 30/-, and one day took it out of his vest pocket and handed it to Jeffreys as a present. This specimen is a fine one, but minus the operculum, and has become polished by too long attrition in Mr. Baxter's pocket.

A correspondent[3] of this journal has recorded the discovery of a pearl "under the mantle" of a *L. littorea*, and writes that "it is 2 mm. in diameter, of a pale horn colour, almost spherical, and slightly translucent, similar to the small brown seed-pearls frequently found in *Unio margaritifer*." He then adds that it is "the first time that a pearl has been found in this species, or, indeed, in any British marine univalve." But this addition is untenable. Although Mr. Coates' find is an interesting one, it is not unique. Gwyn Jeffreys[1] has written—"I have a pearl which was extracted from the common periwinkle; it is round and white, and one-tenth of an inch in diameter." I know of a similiar instance, and there is also the case of another marine species (*Haliotis tuberculata*) producing pearls, a note of which I have already published in this journal.[2]

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[1] Bull. Soc. Zool. de France, 1914. vol. 39, p. 50.

[2] Brit. Conch., vol iii., p. 370.

[3] *Journ. of Conch.*, 1916. vol. 15. p. 10.

Rissoa Frém.—The minute breaking-up of this well-defined genus, despite the protest of authors, is much to be deplored. The authors mentioned, whether right or wrong, are not so obscure that they may be passed over in silence and have their conclusions ignored, nor are their fellow-authors or critics so superior as to be above condescending to notice them. But until some reason is assigned for neglecting to reply to arguments which are at least worth the attention of serious writers and naturalists, little heed need be paid to the advocates of change for mere change sake.

Rissoa striatula Mont.—Lamlash (Norman); Silvercraigs, Clyde (A. Brown); Achil Island.

var. **ecarinata** Monts.—Killala Bay.

R. lactea Mich.—Whitesand Bay, a dead and rolled specimen on the beach. Whitesand Bay is on the Cornish side of Plymouth, and I suspect this specimen had a similar origin to several others which I found near Fowey, in Cornwall, many years ago.[3] But I should not be surprised to hear of its occurrence at the Scillies or the Land's End. It is very plentiful in parts of Jersey, where it was first discovered by the late Mr. Sylvanus Hanley, who used to relate an amusing episode in connection with it. Just as he pounced on his first specimen, he was startled by a gun-fire, and could not realise for the moment whether it was to celebrate his discovery or to punish his excessive jubilation, but on looking up he was horrified to find that all the guns of the fort were (as he supposed) pointing at him; and so they were, but it was only a coincidence that he happened to be in the line of blank fire, consequently he escaped with life, and with his *Rissoa*.

R. cancellata DaCos.—Achil Island; Mull of Cantire, 22f.; Kilbrannan Sound, 25f.

In Jeffreys' figure the spire is too short and pinched up; Sowerby's is right. Var. *hirta* Monts. is "distinguished by two riblets on the penultimate whorl; *R. cancellata* has always three."[1] But the male or dwarf form of *R. cancellata* almost invariably has two riblets only.

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[1] Brit. Conch., vol. iii., p. 373.

[2] Adds. to Brit. Conch., *Journ. of Conch.*, 1915, vol. 14, p. 325.

[3] Adds. to Brit. Conch., *Journ. of Conch.*, 1898, vol. ix., p. 124.

R. calathus F. & H.—Torbay; Benbecula. Jeffreys' figure should be more oblong.

R. hispidula Monts.(=*R. clathrata* Phil., II., pp. 223 and 227, t. 28, fig. 20, Naples).—This species is new to Britain. Dredged off the Menavawr, Scilly Islands, in 40 fathoms, two specimens only, of the male or dwarf form, but I suspect other specimens have been overlooked. It is not uncommon in the Mediterranean. I have previously pointed out[2] how difficult it is to find a line of demarcation between *R. calathus* and *R. reticulata*, but this species tends still further to obscure the boundaries of the three, in consequence of their extreme variations in size and sculpture. The *R. clathrata* of Philippi has been mistaken by various writers for *R. reticulata*, *R. calathus*, and *R. zetlandica*, and the extra-British records of all four species, therefore, require revision and verification. As an instance of this want of identity, I may point out that Gwyn Jeffreys, in his report of the 'Porcupine' Expedition, not only omits *R. hispidula* altogether (though it occurred in many of the dredgings, sometimes abundantly), but in his records therein of *R. calathus* and *R. reticulata* I am able to say, from my own knowledge, that most of them are referable to *R. hispidula*. *R. zetlandica* may very well be eliminated from the group we are considering, as no one need now mistake that species, but the other three seem hopelessly involved when examining large numbers, notwithstanding that individual examples may be placed side by side which indicate differences, and appear as distinct as any other three species of *Rissoa*. It is, again, one of those cases in which neither description nor figures seem to be of ready help, but the student must of necessity go patiently through series of each from different places. Now, *R. hispidula* comes between *R. calathus* and *R. reticulata*, the finer-sculptured forms approximating to *R. reticulata*, and the coarser to *R. calathus*, while all the variations of form and size presented by the two latter are represented in this and even extended; but, generally speaking, *R. reticulata* is oblong, the spiral sculpture prevails over the longitudinal, and the penultimate whorl has six rows of spirals; *R. calathus* is oval, the longitudinals prevail, and the penultimate whorl has four spirals; while *R. hispidula* is conical, the spirals and longitudinals are equalised, and the spiral riblets on the penult vary from six to three, very rarely two. The difficulty of separation is especially great in the dwarf or male forms.

R. reticulata var. *mariæ* d'Orb., of which I have a specimen dredged in the Kyles of Bute in 18f., was mistakenly recorded by me as *R. cimex.*[1] It is much larger and more coarsely sculptured than the type.

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[1] Monterosato: Nomenclatura, p. 64.

[2] *Journ. of Conch.*, 1898, vol. ix., pp. 125-127.

R. jeffreysi Wall.—Flugga Light, North Shetlands (Simpson)! The first two whorls are transversely reticulated, similar to the embryos of *Clathurella* and *Ovula.*

R. abyssicola Forb.—Off Loch Ryan, 27f.: Mull of Cantire, 26f. Also Straits of Korea, 41f., 31·14N., 128·55E. ('Sylvia')!

R. zetlandica Mont.—Benbecula Sound, 10f.; North Rona, 24f.

R. costata A. Ad.—Off Loch Ryan, 25f.; Kilbrannan Sound, 25f.

R. parva var. **semicostata** Jeff., *non* Mont.—There is a supposition that *R. semicostata* Mont. is not a variety of *R. parva,* but a prior name for *R. inconspicua,* especially as Montagu gives its dimensions as "half a line," though that measurement would not apply to either species. But whatever Montagu's species was, authors appear to have been unable to make anything of it, and simply ignore it. Only Captain Brown attempts to describe and figure it after Montagu,[2] but the description would apply to several species, the dimensions given are "one-sixteenth inch," and the figures do not represent any form of *R. inconspicua,* but dwarf or immature *R. parva.* I am quite of opinion that Montagu intended what we now call *R. inconspicua* to be his *R. semicostata*; but he was not sufficiently clear in his diagnosis, and that is fatal to his claim.

var. **exilis** Jeff.—I have some doubt regarding this variety. I have not seen Jeffreys' specimens from the Shetlands on which he founded it, but a series from Falmouth which he examined and named for me many years ago under that name I have since found to be the smooth form of *R. inconspicua.* At the same time, specimens from all the other localities recorded by me for var. *exilis*[3] answer to his description of that variety.

R. albella Lov.—Dartmouth. The type and its variety *sarsii* Lov. are admirably represented in Forbes and Hanley's figures—the former as *R. inconspicua* var. *albula,*[4] and the latter as forms of *R. inconspicua.*[5]

(To be continued).

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[1] *Journ. of Conch.,* 1889, vol. ix., p. 136.
[2] Illust. Rec. Conch., p. 11, pl. ix., figs. 1, 2.
[3] *Journ. of Conch.,* vol. ix., p. 129.
[4] Brit. Moll., pl. lxxvi., figs. 7, 8.
[5] Brit. Moll., pl. lxxxii., figs. 7, 8, 9.

MOLLUSCA AND BRACHIOPODA OF THE IRISH ATLANTIC SLOPE

Between 50 and 1000 Fathoms.

By ANNE L. MASSY.

(Read before the Society, June 9th, 1915).

THE species noted here were taken during investigations carried out on board the fishery cruiser "Helga" of the Department of Agriculture and Technical Instruction for Ireland. Complete lists of all the mollusca and brachiopoda collected will be published later by the Department.

In the list of captures given below it must be understood that a record of number of specimens only implies that the specimens were taken alive. When only empty shells were taken, the record of number is followed by "shell" or "shells."

Canon Norman and Mr. E. A. Smith kindly verified several species and their initials follow the determinations made by them. Mr. E. R. Sykes identified *Solariella ottoi* (Phil.) too late for inclusion in his paper on the molluscs and brachiopods of the deep water off the west and south west coasts of Ireland.[1]

M. Edouard Lamy kindly helped me to compare a shell of *Scala richardi* (Dautz. & de Boury) with the type in the Paris Museum. Mr. Robson, of the British Museum, identified *Cocculina galeola* (Jeff.) adding, however, that it was "an identification quite open to question." I am indebted to Mr. Nichols, of the Dublin Museum, for allowing me to examine many specimens in the Monterosato Collection.

The positions of the various stations are as follows :—

Station.	Date.	Position.	Depth (in fathoms).
C X X	24- 8-'01	77 mi. W.N.W. of Achill Head	382
S.R. 5	14- 2-'03	50 mi. W.N.W. of Tearaght Lt.	312-334½
S.R. 172	5-11-'04	52° 2′ N., 12° 8′ W.	454
S.R. 188	3- 2-'05	51° 53′ N., 11° 59′ W.	320-372
S.R. 223	12- 5-'05	53° 7′ N., 14° 50′ W.	410-500
S.R. 277	15-11-'05	54° 17′ 30″ N., 11° 34′ W.	550
S.R. 331	9- 5-'06	51° 12′ N., 11° 55′ W.	610-680
S.R. 334	10- 5-'06	51° 35′ 30″ N., 12° 26′ W.	500-520
S.R. 335	12- 5-'06	51° 12′ 30″ N., 12° 18′ W.	893-673
S.R. 352	5- 8-'06	50° 22′ N., 11° 40′ W.	800
S.R. 353	6- 8-'06	50° 37′ N., 11° 32′ W.	250-542

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[1] *Ann. Rep. Fish., Ireland*, 1902-03, pt. ii., app iii. [1905].

Station.	Date.	Position.	Depth (in fathoms).
S.R. 365	10/11- 8-'06	51° 25′ N., 11° 32′ W.	385-440
S.R. 399	5- 2-'07	51° 28′ N., 11° 33′ 30″ W.	342
S.R. 486	3- 9-'07	51° 37′ 30″ N., 12° 0′ W.	600-660
S.R. 487	3- 9-'07	51° 36′ N., 11° 57′ W.	540-660
S.R. 489	4- 9-'07	51° 35′ N., 11° 55′ W.	720
S.R. 491	7- 9-'07	51° 57′ 30″ N., 12° 13′ W.	491-520
S.R. 502	11- 9-'07	50° 46′ N., 11° 21′ W.	447-515
S.R. 504	12- 9-'07	50° 42′ N., 11° 18′ W.	627-728
S.R. 505	12- 9-'07	50° 39′ N., 11° 14′ W.	464-627
S.R. 506	12- 9-'07	50° 34′ N., 11° 19′ W.	661-672
S.R. 590	3- 8-'08	51° 51′ 30″ N., 12° 8′ W.	480
S.R. 592	6- 8-'08	50° 39′ N., 11° 25′ W.	400-510
S.R. 746	14- 5-'09	51° 32′ N., 12° 13′ W.	620-658
S.R. 752	16/17- 5-'09	51° 48′ N., 12° 11′ 30″ W.	523-595
S.R. 805	14- 8-'09	51° 52′ N., 12° 14′ W.	539
S.R. 851	9-11-'09	50° 48′ N., 11° 41′ W.	900
S.R. 944	17- 5-'10	51° 22′ N., 12° 41′ W.	982
S.R. 1177	19- 5-'11	51° 54′ 30″ N., 11° 51′ 30″ W.	354-287
S.R. 1242	14- 8-'11	51° 27′ N., 11° 55′ W.	550-590
S.R. 1391	14- 5-'12	51° 33′ N., 11° 23′ 30″ W.	149
S.R. 1454	24- 8-'12	51° 32′ N., 11° 56′ W.	509-493
S.R. 1842	19- 5-'14	51° 7′ N., 11° 35′ 30″ W.	325-410
S.R. 1846	22- 5-'14	51° 26′ N., 11° 45′ 30″ W.	550

NEW TO BRITISH AND IRISH AREA.

Mollusca :—

Nuculana intermedia (M. Sars).—S.R. 486, valve [E.A.S.].

Lima jeffreysi Fischer.—S.R. 752, one.

Callocardia? adamsi E. A. Smith.—S.R. 851, one young [E.A.S.].

Cochlodesma tenerum (Jeff.).—S.R. 752, one.

Cuspidaria obesa (Lovén) var. **glacialis** G. O. Sars.—S.R. 1846, four valves (two broken).

Siphonodentalium teres Jeff.—S.R. 335, one and three shells; S.R. 352, shell; S.R. 851, shell.

Cadulus tumidosus Jeff.—S.R. 486, ten and four shells [N.].

Dentalium caudani Locard var. **parfaiti** Locard.—S.R. 944, four and three shells. The shell of the largest living specimen measures 91 mm. in length.

Acmæa rugosa (Jeff.).—S.R. 1846, three shells.

Puncturella granulata (Seguenza).—S.R. 505, one. Animal in alcohol yellowish-white, with large black eyes, long pointed tentacles, and thick foot with eight cirri on each side. Shell white and lustreless, 7 × 5 mm. × 4 mm. in height. Sculpture *ca.* one hundred beaded longitudinal ribs; marked lines of growth at intervals but no spiral striæ or epidermis.

Fissurella tanneri Verrill.—S.R. 504, one.

Gibbula hettematica Locard.—S.R. 1846, shell.

Cocculina galeola (Jeff.).—S.R. 746, eight.

Pedicularia sicula Swainson.—S.R. 1846, two shells.

Triforis bigemma Watson.—S.R. 1846, shell.

Scala richardi (Dautzenberg & de Boury).—S.R. 487, shell; S.R. 1842, two shells.

Scala tortilis (Watson).—S.R. 504, shell. This is larger and less worn than the type but agrees closely with Watson's description.

Bursa gigantea (Lamarck).—S.R. 1177, one.

Volutomitra grönlandica Beck.—S.R. 277, two shells: S.R. 1846, two and shell.

Clathurella homœotata Watson.— S.R. 506, broken shell [E.A.S.].

Brachiopoda:—

Mühlfeldtia echinata Fischer & Œhlert.—S.R. 504, twenty-two from *Lophohelia*.

NOT PREVIOUSLY RECORDED FROM IRELAND.

Mollusca:—

Nucula tumidula Malm.—S.R. 334, shell: S.R. 335, valve; S.R. 491, one; S.R. 506, six, shell and four valves [N.]; S.R. 590, twenty-seven and two valves [N.]; S.R. 752, seven and valve; S.R. 851, two; S.R. 944, one.

Malletia obtusa (M. Sars).—S.R. 399, valve: S.R. 944, valve. Both probably fossil.

Arca glacialis Gray.—S.R. 172, valve: S.R. 399, two valves; S.R. 1391, valve. All probably fossil.

Pecten grœnlandicus G. B. Sowerby.—S.R. 353, one; S.R. 365, one; S.R. 489, thirteen; S.R. 502, seventy-one; S.R. 505, five and nine valves; S.R. 590, one; S.R. 592, one; S.R. 805, two.

Amussium hoskynsi (Forbes).—S.R. 223, valve.

Thyasira granulosa Jeff.—S.R. 5, one and shell; S.R. 172, fragment of large valve; S.R. 590, four.

Leptaxinus eumyarius (M. Sars).—S.R. 752, valve.

Cuspidaria lamellosa (M. Sars).—S.R. 489, one; S.R. 752, three.

Siphonodentalium lobatum Sowerby.—S.R. 851, three. (The name of *S. vitreum* M. Sars has been altered by Pilsbry and Sharp on account of the existence of the fossil species *Dentalium vitreum* Gmel.).

Solariella ottoi (Phil.).—C X X, two.

Natica nana Möller.—S.R. 944, two shells. (Compared in British Museum with Finmark specimens).

· **Tritonofusus ebur** (Mörch).—S.R. 188, shell.

Bela ovalis (Friele).—S.R. 401, shell; S.R. 1242, shell; S.R. 1454, two shells. (The specimen from S.R. 401 was compared with British Museum examples).

Bela cirrata Brug. (**Mörchi** Malm).—S.R. 590, one and two shells; S.R. 752, five.

Mangilia packardi (Verrill).—S.R. 486, shell; S.R. 752, one.

Actæon exilis Jeff.—S.R. 5, three shells [N.]: S.R. 172, three shells; S.R. 331, shell; S.R. 486, shell; S.R. 590, eight shells; S.R. 752, one and three shells.

Brachiopoda :—

Platydia anomioides Scacchi.—S.R. 353, three; S.R. 504, nineteen from *Lophohelia.*

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Helicella caperata and H. gigaxii climbing trees.—One day in August, 1915, I was collecting in the beech-wood which covers one side of Westwell Beacon, in E. Kent, when I was surprised to see *H. caperata* and *H. gigaxii* in large numbers climbing the trunks of the beeches to a height of quite ten feet from the ground. The nearer the top of the Beacon the fewer became the specimens; but even there they were climbing the trees to a considerable height. Though I have collected in this wood before, I have not noticed these species in it at any other time. From these two facts I conclude that they must have come from a chalk lane at the bottom of the Beacon. They were also climbing the trunks of the pines, of which there are a few scattered about in the wood. Quite a large number of the *caperata* were of the var. *ornata*. The proportion of *caperata* to *gigaxii* was about 3 to 1. In June, 1915, I observed a few examples of *H. caperata* climbing the trunks of the beeches in Darklane Copse, Bradfield, Berks.; but they were never more than four feet from the ground. But on no other occasions have I heard of these species climbing trees. Presumably they find some favourite food on the trunks. For at Westwell eight other species of the mollusca climb the beeches; and I have known *H. nemoralis* ascend there to a height of fifty feet.—A. J. ARKELL (*Read before the Society*, Nov. 10th, 1915).

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EDITORIAL NOTES.

ATTENTION is called to the Hon. Secretary's new address: —Taranaki, Vernon Avenue, Blackpool.

Mr. Stelfox[1] published, early last year ,a very careful study of the Land and Freshwater Mollusca of the Dingle peninsula in co. Kerry. The district has been worked pretty thoroughly by Messrs. Stelfox and Welch, and the results of their labours are described with the author's well-known thoroughness and acumen. Altogether 77 species are reported, including several almost certainly introduced by human agency. We note the occurrence of *Hygromia fusca* Mont., *V. angustior* Jeff., *Planorbis glaber* Jeff., eight species of *Pisidium* including *P. lilljeborgi* Cl., and a reversed specimen of *Acicula lineata* Drp.

Another very complete list[2] for an Irish area is Mr. R. A. Phillips' Non-Marine Mollusca of South Galway, containing the names of 103 species. Several of these again are artificially introduced.

The *Pisidia* number 13, including *P. steenbuchi* Müll., *P. lilljeborgi* Cl., and *P. hibernicum* West., and we may also mention the occurrence of *Vertigo pusilla* Müll. (very rare living in Ireland, though locally abundant as a fossil in sand-dunes), *Ovatella bidentata* Mont., *Amphipeplea glutinosa* Müll., *Pl. glaber* Jeff., *Pl. vortex* L., and *B. leachi* Shep.

A small handbook of 69 pages, illustrated with photos, and two plates borrowed from L. E. Adams' "Manual," has recently appeared, by Canon J. W. Horsley, [3]entitled "Our British Snails." While assuming a chatty and popular style it is unfortunately marred by much slipshod writing, especially in the matter of nomenclature, and by some quite inaccurate statements.

For instance, why talk to a beginner of "the subfamilies *Planorbis*, *Physa*, *Limnæa* and *Ancylus*," and in the next line refer to the *Planorbinæ* without a word of explanation? Why give a beginner such designations as *Stenogyra* (*Azeca*) *tridens*, *Limnæa* (*Ancylus*) *fluviatilis*, *Paludina* (*Bythinia*) *tentaculata* and many others which are not to be found in any list that we know?

Again the author is not careful to stick to one generic or subgeneric name—thus we are told that "*Vitrea lucida* is the largest of the British *Hyalinia*"; *H. hortensis* is a *Tachea* on p. 41 and a *Cepæa* on p. 42; *Paludina* (*Paludestrina*) *jenkinsi* occurs on p. 60, but becomes *Hydrobia jenkinsi* on p. 64.

Reference to Linné will show Canon Horsley that his explanation of the meaning of *A. anatina* is wrong, and that the *anatina* was intended to express "cibus anatum," food for ducks, as Jeffreys says. Presumably *A. cygnæa* is analogous. The word "mollusca" has nothing whatever to do with *esca* food, but is merely a lengthened form of *mollis* soft, while in *Succinea putris* the specific name was no doubt chosen with reference to the [4]softness or, perhaps, the fragility of the shell.

There are other points which seem to merit criticism, did space allow, *e.g.*, the definition of *H. concinna* (p. 43), the list of but five species of *Pisidium*, and the use of various technical terms, such as septa and umbilicus, without explanation. Finally, we may point out that Rimmer's "Land and Freshwater Shells" was published by D. Bogue, of St. Martin's Place, W.C., and not as stated by Canon Horsley.

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[1] Irish Nat., 1915, pp. 17—37.

[2] ibid., pp. 137—150.

[3] Published by the S.P.C.K., Northumberland Avenue, W.C.

[4] cf. Hor. Epod. 8·7 and Verg. Georg. 1·44.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

446th Meeting, held at the Manchester Museum, Nov. 10th, 1915.

The President, Mr. R. Standen, in the chair.

Additions to the Library announced and thanks voted :

"Mollusca of the South-Western States :—VI., The Hacheta Grande, Florida, and Peloncillo Mountains, New Mexico," by H. A. Pilsbry.

"Zoological Results of the Abor Expedition, 1911-12—Mollusca : IV., *Helicidæ*, Genus *Plectopylis*," by G. K. Gude (*from the respective authors*) : and the usual periodicals received in exchange.

New Member Elected.

Miss M. Wilman, The McGregor Museum, Kimberley, South Africa.

Candidates Proposed for Membership.

Mrs. Gilbert Norwood, 4, The Glen, Saundersfoot, Pembrokeshire (introduced by W. E. Hoyle and J. Davy Dean).

George A. Martin, Sherwood, Newport Road, Cardiff (introduced by W. E. Hoyle and J. D. Dean).

Papers Read.

"Some New Varietal Forms in the Genus *Cypræa*," by J. Kidson Taylor.

"Resemblance of the Cocoons of *Talaeporia tubulosa* to *Clausilia bidentata*," by A. J. Arkell.

"*Helicella caperata* and *H. gigaxii* Climbing Trees," by A. J. Arkell.

"Tree Climbing by *Helicella caperata* (Müll.)," by Norman G. Hadden.

"*Zonitoides nitidus* (Müll.) New to Herefordshire," by Norman G. Hadden.

"Notes on Some North Devon Mollusca," by Norman G. Hadden.

"*Helix pisana* Müll. at Porthcawl, Glamorganshire," by J. Davy Dean.

"*Physa heterostropha* in Bucks," by Arthur E. Salisbury.

Exhibits.

By Mr. G. C. Spence : Series of land mollusca from Mudros, East Lemnos ; and of *Helicina* from Central and South America, Cuba, etc.

By Mr. J. Davy Dean : Series of *Helix pisana* to illustrate his paper.

By Mr. J. Kidson Taylor : Examples of the new varieties of *Cypræa* described in his paper.

By Mrs. Gill : A series of the typical *Murices*, or *Tribulus* group.

By Rev. L. J. Shackleford : A fine adult, live shell of *Voluta mamilla* Gray, from Western Port, Victoria ; also a specimen in good condition of *V. roadnightæ* McCoy from the same locality.

It was decided to have the following **Special Exhibits** at future meetings :

The Section *Alopia* of *Clausilia* - January 12th, 1916.
The Genus *Cyclostoma* - - - February 9th, 1916.
The Genus *Terebra* - - - March, 8th, 1916.

447th Meeting, held at the Manchester Museum, Dec. 8th, 1915.

The President in the chair.

Additions to the Library announced and thanks voted :—

"Reeve's 'Conchologia Iconica': Monographs of *Ancillaria* ; *Ovulum* ; *Erato* ; *Carinaria* ; *Sigaretus* ; *Bullia*."

"Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen: Mollusken," by E. von Martens (*presented by J. Wilfrid Jackson*); and the usual periodicals received in exchange.

Donation to Cabinet announced and thanks voted:

By Mr. E. Collier: A set of *Balea perversa*, labelled "Manchester," from the DaCosta Collection. These specimens are evidently from the collection of the late Mr. Thomas Rogers, and presumably from his Agecroft locality—now destroyed—which was the only one known in South Lancashire.

Donations to the Autograph Collection announced and thanks voted:—

By Mr. J. R. le B. Tomlin: de Folin, Jeffreys, Wollaston and Brancsik.

By Mr. John Ponsonby: Some two hundred letters, including Tryon, Morelet, von Maltzan, Marie, Loven, Locard, Brot, W. T. Blanford, Crosse, von Martens, Hanley, Gulick, Clessin, Aradas, Westerlund, Paulucci and Jeffreys.

New Members Elected.

Mrs. Gilbert Norwood.

George A. Martin.

Candidates Proposed for Membership.

John S. Gladstone, Nanhurst, Cranleigh, Surrey (introduced by Lt.-Col. H. H. Godwin-Austen and Lewis J. Shackleford).

Alfred W. Pye, Mortayne, Dudley Street, Grimsby (introduced by G. B. Sowerby and Hugh C. Fulton).

Resignation.

F. H. Sikes, M.A., F.L.S.

Papers Read.

"*Pisidium lilljeborgi* in Nant Ffrancon, Carnarvonshire," by C. Oldham.

"*Limax tenellus* in Shropshire," by C. Oldham.

"*Paludestrina jenkinsi* in Carnarvonshire," by C. Oldham.

"Preliminary Note on the genitalia of *Acanthinula lamellata* Jeff.," by A. E. Boycott, F.R.S.

"Note on the genitalia of *Theba cantiana* Mont.," by A. E. Boycott, F.R.S.

"Notes on some Shell Beaches and rare Cornish Marine Shells," by Alan Gardiner, B.A.

"On a supposed New Species of *Limicolaria*," by Lewis J. Shackleford and G. C. Spence.

"The discovery of *Hygromia umbrosa* Partsch in England," by J. W. Taylor, M.Sc.

Exhibits.

By Mr. G. C. Spence: Types of *Limicolaria albinsiensis* and var. *aurea* Shackleford and Spence; the rare *Holospira cockerelli* Dall from New Mexico, also a double-mouthed example of same.

By Mr. R. Standen: *Leucochiloides fabianus* Gredler; *Cionella ovampoensis* Melvill and Ponsonby; and *Opeas micra* D'Orb., collected in gardens and banana groves at Khartum, Sudan, by Mr. R. Cottam. It is probable that these species have been introduced with non-indigenous plants, such as the banana, otherwise they would be an important addition to the scanty land-shell fauna of the Sudan.

By Mr. Chas. Oldham: A series of shells to illustrate his notes, including the following species: *Pisidium lilljeborgi*, Llyn Cwm Clyd, Nant Ffrancon, Carnarvonshire; Llyn Idwal and Llyn Ogwen, Nant Ffrancon, Carnarvonshire; *Paludestrina jenkinsi* var. *aculeata* near Criccieth, Carnarvonshire; *Limnæa peregra* var. ? Ffynnon Lloer, Carnarvonshire (2,250 feet); *H. arbustorum* var.

fusca, *H*, *nemoralis* var. *tenuis* Clynnog Fawr, Carnarvonshire; *Pomatias elegans* Eglwyseg Rocks, Denbighshire; *Pom. elegans* var. ? Gaddesden Hoo, Herts.; *Vertigo pygmæa*, *Val. excentrica*, *Val. costata* Hudnall Common, Herts.; *H. gigaxii* and var. *lutescens* Great Gaddesden, Herts.; *H. gigaxii* var. *albicans* Drayton Beauchamp, Bucks.

By Mr. J. W. Taylor; *Hygromia umbrosa* Partsch, collected at Margate by Mr. J. C. Dacie, to illustrate his note.

By Rev. L. J. Shackleford: A series of beautifully executed photos, by Mr. John S. Gladstone, of *Voluta africana* Rve. and var. *beckeri* nov. Shackleford; also *Marginella tomlini* Shackleford and *M. taylori* Shackleford. The types of these are unique and belong to the South African Museum.

448th Meeting, held at the Manchester Museum, January 12th, 1916.

The President, Mr. R. Standen, in the chair.

Additions to the Library announced and thanks voted:

"Tryon's Manual of Conchology," pt. 91, by H. A. Pilsbry.

"Notes on the Species of the Molluscan Sub-genus *Nucella* inhabiting the north-west coast of America and adjacent regions," by W. H. Dall.

"Three New Species of *Anodontites* from Brazil," by W. B. Marshall.

"Verzeichniss der Landschnecken Dänemarks," by C. M. Steenberg.

"Strandwandelingen, iv., Mollusken [of Dutch coast]," by W. G. N. van der Sleen (*from the respective authors*).

"New *Clausilias* from Malta," by A. C. Gatto.

"Disappearance of *Spondylus gæderopus* L. and other species from Maltese waters," by A. C. Gatto.

"Les Pleurotomaires," by E. L. Bouvier (*presented by the Manchester Museum*).

Resignation.

Rev. Hy. A. Hudson.

Death.

J. J. MacAndrew, F.L.S., etc.

New Members Elected.

A. W. Pye.
J. S. Gladstone.

Paper Read.

"Notes on *Marginella*," by J. R. le B. Tomlin, M.A.

Exhibits.

By Mr. G. C. Spence: A series of *Stoastoma*, *Jerdonia*, *Cyathopoma* and *Lagochilus*.

By Mrs. Gill: An extensive series of the *Epidromus* sub-genus of *Triton*, and of the genus *Distorsio*.

By Mr. T. H. Platt: Some beautiful examples of *Arconaia lanceolata* Lea, China; *Mutela exotica* Lam., *M. rostrata* Rang, and *M. nilotica* Sow., from the Nile; *M. dubia* Gmelin, from Senegal; and *Chelidonopsis hirundo* von Marts., from Nsendwe, Congo.

In the special exhibit of the *Alopia* section of *Clausilia* examples of nearly all the species known were shown by Messrs. J. Cosmo Melvill and E. Collier. A very interesting account of the peculiar characters of this group, its limited geographical distribution, habitats and affinities with *Balea*, etc., was given by Mr. Collier.

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ON THE CONCHOLOGICAL FEATURES OF THE LENHAM SANDSTONES OF KENT AND THEIR STRATIGRAPHICAL IMPORTANCE.

(Presidential Address delivered at the Annual Meeting, October 16th, 1915).

By R. BULLEN NEWTON, F.G.S.,[1]
of the British Museum.

Plates 1—4.

Introduction.
Bibliography.
List of the Conchological Determinations.
Distribution Table.
Conclusions.
Explanation of Plates.
Index.

Introduction.

At various points along the summit of the chalk escarpment forming the North Downs of Kent and Surrey and extending from Paddlesworth near Folkestone to Lenham near Maidstone, and thence to Netley Heath between Guildford and Dorking—a distance east and west of about seventy miles—there occur in pockets, cavities, or "pipes" of the chalk formation, certain scattered masses of a reddish ferruginous sandstone at considerable altitudes above sea-level; at Paddlesworth this sandstone has been observed at 600 feet; at Lenham 680 feet; while at Netley Heath it is found at a height of between 570 and 600 feet. Sandstones of corresponding age are met with in France particularly on the hills between Calais and Boulogne, and on Cassel Hill near Dunkirk at 515 feet; they also occur at Louvain (200 feet) and Diest, both in Belgium, the beds of the latter locality having yielded fossiliferous remains bearing a resemblance to the Lenham fauna, although often differing in specific characters.

The more important of these sandstone deposits, so far as this country is concerned, are those found on the Lenham Downs, as they contain the remains of a marine fauna, chiefly of conchological interest, whereas the beds of other districts are generally unfossiliferous, although it should be mentioned that a few mollusca of rather uncertain character have been obtained from both Paddlesworth and Netley Heath.

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[1] Published by permission of the Trustees of the British Museum.

The fossils known in the various museum collections have been mostly obtained from a large dis-used chalk quarry situated about half-a-mile to the north of Lenham, of which an excellent sketch may be consulted in Mr. Reid's "Pliocene" memoir of 1890, showing the vertical positions assumed by the fossiliferous sandstone-pipes seen in the limestone exposure. It has been generally recognised that such deposits represent the remnants of a marine Tertiary formation belonging to early Pliocene times, although my own investigations have led to somewhat different results, and I am more inclined to refer them to the latest division of the Miocene period.

The organisms occur as casts and cavities in the sandstone, and are frequently in a fragmentary condition, rendering their determination extremely difficult. The walls of the cavities, however, often retain sculpture characters, so that it is possible by the aid of wax impressions to obtain reliable evidence as to external details which may be safely used for purposes of identification. To Mr. Clement Reid, F.R.S., we are mainly indebted for most of our later knowledge of the Lenham fauna, his researches forming part of the "Pliocene" memoir before mentioned. At that time Mr. Reid had obtained an important series of fossils from the Lenham beds for the Museum of Practical Geology, which, after being determined, were systematically referred to in the memoir. In order to facilitate my studies on this subject and to enable me to determine certain collections of similar fossils in the British Museum, especially that formed by Mr. Graham Wallas, I was very kindly allowed to loan this valuable type collection made by Mr. Reid. During my studies in this direction, it has been necessary to introduce a certain amount of revision, both among the genera and species as laid down in Mr. Reid's memoir. The larger amount of material available at the present time has also resulted in the determination of additional species, so that the shells are regarded as numbering 77 species, which include 1 Scaphopod, 32 Gastropods, 43 Pelecypods, and 1 Brachiopod, whereas Mr. Reid's conchological list embraced 65 species, consisting of 1 Scaphopod, 27 Gastropods, 36 Pelecypods, and 1 Brachiopod. Among the 32 Gastropods now recognised, a new species has been described under the designation of *Ringiculella lenhamensis*. In view of the fact that no figures have yet been published of Lenham fossils, I have had prepared some photographs of the more important shell-remains, which on account of their reddish-brown colour and their more or less obscure character have not been particularly successful; yet it is hoped they may serve a useful purpose in stimulating the interest of the student who desires to pursue further researches on the conchology of these little-known beds.

To complete the Lenham fauna I have here briefly introduced a list of the other organic remains which are found associated with the shells :—

Pisces—Selachian vertebræ and a palatal plate as determined by Dr. A. S. Woodward.
COLLECTION : B.M.[1] (Graham Wallas).

Polyzoa—*Fascicularia aurantium* M. Edwards.
COLLECTION : M.P.G. No. 398.
Cupularia canariensis Busk.
COLLECTIONS : M.P.G. No. 399.
B.M. (Graham Wallas).

Annelida—*Ditrupa subulata* Deshayes, sp.
COLLECTION : M.P.G. No. 395.

Crustacea—[A decapod claw].
COLLECTION : B.M. (Graham Wallas).
Balanus.
COLLECTION : M.P.G. No. 396.

Echinodermata—*Temnechinus* ?
COLLECTION : B.M. (Graham Wallas).
Echinus woodwardi Desor.
COLLECTIONS : M.P.G. No. 394.
B.M. (Prestwich and Graham Wallas).
Dorocidaris papillata Leske, sp.
COLLECTION : B.M. (Prestwich).

Actinozoa—*Trochocyathus* (?)
COLLECTION : B.M. (Graham Wallas).

In addition to these organisms the Lenham sandstones occasionally exhibit impressions of the spines of *Cidaris clavigera* König, and remains of *Inoceramus*-shell associated with the sponge, *Cliona*, all of which belong to the chalk (Senonian) formation, and are consequently of derivative origin. No trace has been discovered in these beds of any fossils which could possibly have been derived from Eocene rocks.

In concluding this preliminary statement, I should wish to acknowledge my gratitude to the authorities of the Museum of Practical Geology for allowing me access to the "Reid" Collection, and particularly to Mr. H. A. Allen, F.G.S., of that institution for facilitating most of the arrangements in connection therewith.

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[1] NOTE.—The letters B.M. and M.P.G. throughout this work apply respectively to the British Museum and the Museum of Practical Geology.

BIBLIOGRAPHY (1857-1915).

NOTE.—The conchological determinations mentioned in the following memoirs are those of the authors themselves, without any attempt at a rectification of the nomenclature.

THE history of the Lenham deposits and their fauna was commenced by the late Sir Joseph Prestwich in 1857,[1] when reporting the discovery by W. Harris and Rupert Jones of certain "blocks of gritty ferruginous sandstone, full of casts of shells," in some sandpipes in the chalk at Lenham, eight miles east of Maidstone, which they regarded as belonging to the basement-bed of the London Clay. Prestwich was familiar with similar sandstones occurring at Paddlesworth near Folkestone, at a height of about 600 feet above sea-level, and at Vigo Hill near Otford in Kent, mentioning likewise that they were to be found in scattered fragments along the summit of the North Downs, extending from near Folkestone to Dorking in Surrey; but from the fossils he considered that the sandstones were of Lower Crag age, on account of the presence of a *Terebratula* resembling *T. grandis*, several species of *Astarte*, and a large *Lutraria*-like shell; this view being also shared by Searles Wood, who had examined the fossil remains, and recognised the importance of the occurrence of a *Pyrula* and an *Emarginula* as supporting that horizon. Prestwich also noted that beds of similar structure were present on the hills between Calais and Boulogne, at Cassel Hill near Dunkirk, and at Louvain and Diest in Belgium, besides thinking it possible that such sandstones were connected with the Carentan beds of Normandy.

In the following year Prestwich[2] again returned to the subject, aided by Searles Wood. He noticed that many of the species found at Lenham were of southern origin, thus confirming his previous ideas that the deposits were of Lower or Coralline Crag age. His determinations of the shells included the following forms :—

Scaphopoda—

Dentalium costata ?

Gastropoda—

Emarginula reticulata ?
Nassa prismatica ?
Scalaria subulata ?
Pyrula.
Trochus.
Natica.
Rissoa ?
Phorus related to *Trochus cumularis* Brong.

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[1] On some Fossiliferous Ironstone occurring on the North Downs: *Quart. Journ. Geol. Soc.*, 1857, vol. xiii., pp. 212, 213.

[2] On the Age of some Sands and Iron-Sandstones on the North Downs; with a Note on the Fossils, by S. V. Wood: *Quart. Journ. Geol. Soc.*, 1858, vol. 14, pp. 322—335.

made by Mr. Clement Reid,[1] who regarded the beds as Older Pliocene of Coralline Crag age, and equivalent to the Lower Crag or Diestian of Belgium. He recognised that the St. Erth beds were of similar age and not newer. Speaking of the Lenham mollusca, he stated that *Arca diluvii* was new to England, and that *Pleurotoma consobrina*? and *P. jouanneti*? were species belonging to the Upper Miocene of the continent. His list of determinations, endorsed by Messrs. Sharman and E. T. Newton, included 16 Gastropods, 21 Pelecypods, and 1 Brachiopod.

Four years later fuller particulars of the Lenham deposits were published by the same author[2] in a memoir on the British Pliocenes. They were alluded to as occurring in pipes of the Chalk formation, frequently at considerable heights above the sea, near Lenham itself being found at 680 feet above sea level. The whole of the British Pliocene series were grouped into "Newer" and "Older," the latter containing the following divisions :—

OLDER PLIOCENE :—

St. Erth Beds.
Coralline Crag.
Lenham Beds.
Box-Stones.

In connection with the Lenham mollusca it was stated that such southern genera as *Ficula* (*Pyrula*), *Xenophora* (*Phorus*), *Triton*, and *Avicula*, occurring in association with a profusion of *Arca diluvii*, *Cardium papillosum*, and some south European extinct species of *Pleurotoma* and *Terebra*, represented a fauna in favour of a southern or Mediterranean origin.

A full list of fossils from the Lenham and other Pliocene deposits of England was given in tabular order, showing the distribution of each species in Belgium, France, etc., the Lenham shells alone including 65 species, made up of 27 Gastropoda, 1 Scaphopoda, 36 Pelecypoda, and 1 Brachiopoda, as follows :—

Gastropoda—

Actæon tornatilis Linnæus,
Aporrhais pespelicani Linnæus,
Buccinum dalei J. Sowerby,
Cancellaria contorta Basterot,
Cerithium tricinctum Brocchi,
Cypræa europæa Montagu,
Emarginula fissura Linnæus,
Eulima subulata Donovan ?
Fissurella græca Linnæus,
Margarita trochoidea S. V. Wood,
Nassa prismatica Brocchi,
Natica millepunctata Lamarck,
Natica varians Dujardin,
Pleurotoma consobrina Bellardi,
Pleurotoma jouanneti Desmoulins,
Pleurotoma turrifera Nyst,
Pyrula reticulata Lamarck,
Ringicula ventricosa J. Sowerby,

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[1] The Pliocene Deposits of North-Western Europe : *Nature*, 1886, vol. 34, pp. 341—343.

[2] The Pliocene Deposits of Britain—Lenham Beds (Diestian): *Mem. Geol. Surv. United Kingdom*, 1890, pp. 2, 42—58, etc.

Gastropoda *(continued)*—

Scalaria clathratula Adams,
Scaphander lignarius Linnæus,
Terebra acuminata Borson,
Triton heptagonum ? Brocchi,
Trochus cinerarius Linnæus,
Trochus millegranus Philippi,
Trochus ziziphinus Linnæus,
Turritella planispira S. V. Wood,
Xenophorus sp.

Scaphopoda—

Dentalium dentalis ? Linnæus.

Brachiopoda—

Terebratula grandis Blumenbach.

Pelecypoda—

Arca diluvii Lamarck,
Arca lactea Linnæus,
Artemis exoleta Linnæus,
Astarte basteroti Lajonkaire,
Astarte omalii Lajonkaire,
Astarte galeottii Nyst,
Avicula phalænoides ? S. V. Wood,
Cardita senilis Lamarck,
Cardium papillosum Poli,
Cardium n.sp.,
Cyprina islandica Linnæus,
Cytherea chione Linnæus,
Diplodonta astartea ? Nyst,
Diplodonta dilatata S.V.Wood,
Donax politus Poli,
Gastrana fragilis Linnæus,
Hinnites cortesyi Defrance,
Isocardia cor Linnæus,
Leda semistriata ? S. V. Wood,
Lepton deltoideum S. V. Wood,
Lima loscombii ? G. B. Sowerby,
Lutraria elliptica Lamarck,
Mactra arcuata J. Sowerby,
Nucula sulcata Bronn,
Ostrea princeps S. V. Wood,
Pecten maximus Linnæus,
Pecten princeps J. Sowerby,
Pecten varius Linnæus,
Pecten n.sp.,
Pectunculus glycimeris Linnæus,
Pholadidea papyracea Solander,
Solen ensis Linnæus,
Tellina benedeni Nyst,
Tellina donacina Linnæus,
Thracia pubescens Pulteney,
Thracia ventricosa Philippi.

The next paper of importance was by Mr. F. W. Harmer,[1] in which the Lenham beds were regarded as of older age than the Coralline Crag, on account of the more southern facies of the fauna, some of the molluscan species being characteristic of Miocene or Italian Lower Pliocene, which are unknown or rare in the Coralline Crag. The author included a distribution table of shells from the Belgian Diestian beds, showing the Lenham occurrence as well as those found in the "Box-Stones" of Suffolk. In the following year the same author[2] referred the Lenham beds to the Older Pliocene under the new horizonal term of "Lenhamian," and further recognised them in a classification table as belonging to the "zone of *Arca diluvii*," and of the age of the Diestian sands.

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[1] The Pliocene Deposits of the East of England ; the Lenham Beds and the Coralline Crag : *Quart. Journ. Geol. Soc.*, 1898, vol. 54, p. 308.

[2] On a Proposed New Classification of the Pliocene Deposits of the East of England : *Report British Assoc.* (*Dover*), 1899, p. 752.

A more extended scheme of the Pliocene deposits of the East of England was again published by Mr. Harmer,[1] based on his classification table of 1899. In this the Older Pliocene beds were divided into:—

LENHAMIAN	LENHAM BEDS:	Zone of *Arca diluvii*	- Diestian.
	BOX-STONES:	Base of Red Crag, Base of Coralline Crag at Sutton.	- Waenrode-Beds ?

The Coralline Crag deposits were scheduled as the basement of the Newer Pliocene series of rocks, which he had formerly placed in the Older Pliocene.

Mr. W. P. D. Stebbing[2] next announced the discovery of some molluscan remains in a patch of sand and ironstone at Netley Heath, Surrey, between Dorking and Guildford, along the top of the North Downs, at heights varying from 570 to 600 feet, O.D. The specimens, consisting of sandstone casts, were referred to the genera *Cyprina* ?, *Modiola*, *Nassa*, *Trochus*, *Cardium*, *Pectunculus*, *Tellina*, and *Thracia*, no specific determinations being given. The author inclined to the view that these sandy deposits were a westerly extension of the Lenham beds near Maidstone, and those at Paddlesworth north of Folkestone.

Referring to the Lenham fossils, which Mr. E. Van den Broeck[3] had examined at the Museum of Practical Geology, that author was of opinion that they represented a fauna of Diestian age. He noted the presence of older forms corresponding to the Bolderian (Upper Miocene) fauna of Belgium, and among the Box-Stones at the Ipswich Museum he identified species found in the Belgium Miocene. He concluded, therefore, that the Lenham beds were Diestian, and that the Box-Stones corresponded with the Bolderian of Belgium, or probably a more recent horizon which represented the Mio-Pliocene or Older Pliocene, a period slightly anterior to the Diestian. He was, also, of opinion that the zones of *Terebratula grandis* and *Isocardia cor* could not be separated, but belonged alike to the Diestian division of the Pliocenes.

(*To be continued*).

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[1] The Pliocene Deposits of the East of England, part 2: The Crag of Essex (Waltonian) and its Relation to that of Suffolk and Norfolk: *Quart. Journ. Geol. Soc.*, 1900, vol. 56, p. 708.

[2] Excursion to Netley Heath and Newlands Corner: *Proc. Geologists' Assoc.*, 1900, vol. 16, pp. 524—526.

[3] Le Diestien et les Sables de Lenham, le Miocene démantelé et les Box-Stones en Angleterre: *Bull. Soc. Belg. Géol. (Bruxelles) Procès-verbaux* 1902, vol. 16, pp. 170—173.

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ON THE CONCHOLOGICAL FEATURES OF THE LENHAM SANDSTONES OF KENT AND THEIR STRATIGRAPHICAL IMPORTANCE.

(Continued from page 64).

By R. BULLEN NEWTON, F.G.S.,[1]
of the British Museum.

(Presidential Address delivered at the Annual Meeting, October 16th, 1915).

In a further contribution, Mr. Harmer[2] regarded the Lenham beds as synchronous with the ferruginous sandstones of Louvain and Diest. He stated that among the Diestian sandstone fossils were about sixty species of mollusca, some being Crag forms, whereas a few were of an older or Miocene type and not found in the Coralline Crag; similarly the Lenham shells included many Miocene species, such as *Terebra acuminata*, *Triton heptagonum*, *Pleurotoma consobrina*, *P. jouanneti*, *Cancellaria contorta*, *Hinnites cortesyi*, and *Arca diluvii*. A table of the British Pliocene deposits was included, being nearly similar to that issued by the same author in 1900, in which the "Lenhamian" formed the lowest of the Pliocene stages, the Box-Stones being regarded as equivalent to the Waenrode Beds of Belgium (Bolderian, according to Mr. Van den Broeck).

Subsequently, Mr. Harmer[3] repeated his former views on the age of the Lenham deposits, the fauna being spoken of as presenting a distinctly older type than that of the Coralline Crag and approaching more nearly a Miocene facies, instancing, among other shells, the abundance of *Anadara diluvii*, which occurs in the Vienna Basin, the Touraine area of France, and the Bolderian of Belgium.

In their memoir on the geology of Holland, Messrs. G. A. F. Molengraaff and A. J. M. Van Waterschoot Van der Gracht[4] referred to the occurrence of *Anadara diluvii* in the Lenham beds as indicative of a Miocene age, the same shell being found in the Miocene deposits of Peel and Winterswyk in Holland, the rocks of the former place being stated as the equivalent of the "Glimmertons" of the north of Germany or the Tortonian stage of the Miocene, whilst the beds at Winterswyk were regarded as Middle Miocene. This work also included lists of molluscan species from the Upper and Middle Miocene deposits of Holland, many of which are found in the Lenham beds.

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[1] Published by permission of the Trustees of the British Museum.

[2] A Sketch of the Later Tertiary History of East Anglia: *Proc. Geologists' Assoc.*, 1902, vol. 17, pp. 416—479.

[3] The Pliocene Deposits of the Eastern Counties of England: *Geologists' Assoc. Jubilee Volume*, 1908, pp. 86—102.

[4] Niederlande; *Handb. Region. Geologie*, 1913, vol. 1, part 3, pp. 51—53.

Another reference to the geological aspect of this subject has been made by Mr. F. W. Harmer[1] in an "Introduction" to a new work on British Pliocene Mollusca, where he adheres to his previously expressed views that the Lenham Beds with the "Box-Stones" and the Belgian Diestian deposits should be grouped as Lower Pliocene and that the Coralline Crag beds of East Anglia should form the base of the Upper Pliocenes.

A final notice to make involves a slight alteration in the views of Mr. C. Reid[2] who, in a work recently published, places the Coralline Crag and Lenham Beds in the Lower Pliocene group bracketing them as equivalent to the Diestian—but the "Box-Stones" are scheduled as Miocene.

LIST OF THE CONCHOLOGICAL DETERMINATIONS.

Gastropoda—

The FAMILIES represented follow the order of Pelseneer's "Classification" (Ann. Soc. R. Mal. Belgique, 1894, vol. 27, pp. 31—243).

Fissurellidæ
Trochidæ
Capulidæ
Cypræidæ
Naticidæ
Cerithiidæ
Scalidæ
Pyramidellidæ
Eulimidæ
Turritellidæ
Xenophoridæ
Aporrhaiidæ
Cassididæ
Ficidæ (=*Pyrulidæ*)
Fusidæ
Nassidæ
Muricidæ
Cancellariidæ
Volutidæ
Turridæ (=*Pleurotomidæ*)
Terebridæ
Actæonidæ
Ringiculidæ
Scaphandridæ

Fam. FISSURELLIDÆ.

CAPILUNA GRÆCA Linnæus. [Plate 4, figs. 6, 7].

Patella græca Linnæus: Syst. Naturæ, 1758, ed. x., p. 784.

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[1] The Pliocene Mollusca of Great Britain: *Mon. Pal. Soc.*, 1914, part 1, p. 5.

[2] C. & E. M. Reid: The Pliocene Floras of the Dutch-Prussian Border, *Mededeel. Rijks. Delfst.*, 1915, No. 6, p. 9.

Capiluna cuvieri J. E. Gray: Guide Syst. Distrib. Moll., British Museum, 1857, part 1, p. 166.

NOTE.—Gray's *Capiluna*, 1857, replaces *Glyphis* of Gould and Carpenter, 1856, preoccupied by Agassiz for a genus of fish.

Distribution—

Recent	British and Mediterranean Seas, &c.
Red Crag	Britain
Scaldisian	Belgium
Coralline Crag Lenham Beds	Britain
Redonian (Tortonian)	France, N.W.
Vindobonian	Italy; Vienna Basin.

Collections—

M.P.G., No. 450.
B.M. (Graham Wallas).

EMARGINULA FISSURA Linnæus. [Plate 4, fig. 8].

Patella fissura Linnæus: Syst. Naturæ, 1758, ed. x., p. 784.

Emarginula fissura Lamarck: Syst. Anim. sans Vert., 1801, p. 69.

Distribution—

Recent	North East Atlantic to the Canary Islands
Red Crag	Britain
Scaldisian	Belgium
Astian	Italy
Plaisancian	France; Italy
Coralline Crag Lenham Beds	Britain
Anversian	Belgium
Redonian (Tortonian)	France, N.W.

Collections—

M.P.G., No. 448.
B.M. (Prestwich and Kennard).

Fam. TROCHIDÆ.

EUMARGARITA TROCHOIDEA S. V. Wood. [Plate 3, figs. 7, 8].

Margarita trochoidea S. V. Wood: Mon. Pal. Soc., 1848, pl. 15, fig. 2, p. 136.

Distribution—

Coralline Crag Lenham Beds	Britain.

Collections—

M.P.G., No. 452.
B.M. (Graham Wallas).

GIBBULA CINERARIA Linnæus.

Trochus cinerarius Linnæus: Syst. Naturæ, 1758, ed. x., p. 758.

Gibbula cineraria Tryon: Man. Conchology, 1887, vol. xi., part 3, p. 208.

Distribution—

Recent	British and European Seas
Post Glacial	Britain
Glacial	
Red Crag	
Scaldisian	Belgium
Lenham Beds	Britain.

Collections—

M.P.G., No. 472.
B.M. (Prestwich).

CALLIOSTOMA ZIZYPHINUM Linnæus.

Trochus zizyphinus Linnæus: Syst. Naturæ, 1758, ed. x., p. 759.

Calliostoma zizyphinum Pilsbry (Tryon): Man. Conchology, 1890, vol. xi., part 4a, p. 388.

Distribution—

Recent	British and Mediterranean Seas
Red Crag	Britain
Scaldisian	Belgium
Coralline Crag	Britain
St. Erth Beds	
Box Stones	
Lenham Beds	
Diestian	Belgium.

Collections—

M.P.G., No. 471.
B.M. (Graham Wallas).

AMPULLOTROCHUS MILIARIS Brocchi.

Trochus miliaris Brocchi: Conch. Foss. Subapennina, 1814, vol. 2, pl. 6, fig. 1, p. 353.

Ampullotrochus miliaris var. *millegranus* Sacco: Moll. Terz. Piemonte, 1896, part 21, pl. 4, fig. 42, p. 44 (=*Trochus millegranus* Reid).

Distribution—

Recent	British and Mediterranean Seas, &c.
Astian	Italy
Plaisancian	
Coralline Crag	Britain
St. Erth Beds	
Lenham Beds	

Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	Italy; Vienna Basin; Holland.

Collections—

M.P.G., No. 470.
B.M. (Prestwich).

Fam. CAPULIDÆ.

CAPULUS UNGARICUS Linnæus.

Patella ungarica Linnæus: Syst. Naturæ, 1758, ed. x., p. 782.

Capulus ungaricus S. V. Wood: Mon. Pal. Soc., 1848, pl. 17, fig. 2, p. 155.

Distribution—

Recent	British and European Seas, &c.
Glacial Red Crag	Britain
Scaldisian	Belgium
Coralline Crag St. Erth Beds	Britain
Diestian	Belgium
Redonian (Tortonian)	France (N.W.)
Vindobonian	Italy; Vienna Basin.

Collection—

B.M. (Graham Wallas).

Fam. CYPRÆIDÆ.

TRIVIA EUROPÆA Montagu.

Cypræa europæa Montagu: Testacea Britannica, Suppl., 1808, p. 88.

Trivia europæa Dollfus: Bull. Soc. Géol., Normandie, 1880, vol. 6, p. 514.

Distribution—

Recent	British and Mediterranean Seas
Glacial Red Crag	Britain
Scaldisian	Belgium
Astian Plaisancian	Italy; France
Coralline Crag St. Erth Beds Lenham Beds	Britain
Diestian Anversian	Belgium
Redonian (Tortonian)	France (N.W.)
Vindobonian	Italy; Vienna Basin.

Collection—

M.P.G., No. 446.

Fam. NATICIDÆ.

NATICA SPP. INDET.

Including *N. varians* and *N. millepunctata* which are both recorded from the Lenham Beds by Mr. Reid, although it is here considered that the material on which these determinations were based is insufficient to justify their accuracy.

Collections—

M.P.G., Nos. C.R. 1261, 1262 and 455, 456, 458.
B.M. (Graham Wallas and Kennard).

Fam. CERITHIIDÆ.

PTYCHOPOTAMIDES TRICINCTUS Brocchi. [Plate 3, fig. 3].

Murex tricinctus Brocchi: Conch. Foss. Subapennina, 1814, vol. 2, pl. 9, fig. 23, p. 446.

Ptychopotamides tricinctus Sacco: Moll. Terz. Piemonte, 1895, part 17, pl. 3, figs. 8 and varieties 8^{bis} to 10, pp. 44, 45.

Distribution—

Glacial	Britain
Norwich Crag	
Red Crag	
Scaldisian	Belgium
Astian	Italy
Plaisancian	
St. Erth Beds	Britain
Lenham Beds	
Redonian (Tortonian)	France (N.W.)
Vindobonian	Italy.

Collections—

M.P.G., No. 445.
B.M. (Graham Wallas and Kennard).

Fam. SCALIDÆ.

SCALA SUBULATA, J. de C. Sowerby. [Plate 4, fig. 5].

Scalaria subulata, J. de C. Sowerby: Mineral Conchology, 1823, vol. 4, pl. 390, fig. 1, p. 125.

Distribution—

(?) Recent	Atlantic; Teneriffe: G. Jeffreys
Red Crag	Britain
Scaldisian	Belgium
Diestian	
Coralline Crag	Britain.
Lenham Beds	

Collections—

M.P.G., No. 466.

B.M. (Prestwich and Graham Wallas).

HYALOSCALA CLATHRATULA Kanmacher.

Turbo clathratulus Kanmacher : in George Adams' "Essays on the Microscope," 1798, ed. 2, pl. 14, fig. 19, p. 637.

Hyaloscala clathratula De Boury. : Bull. Soc. Mal. Italiana, 1890, vol. 14, pp. 246, 247.

Distribution—

Recent	British and Mediterranean Seas, &c.
Scaldisian Diestian	Belgium
Coralline Crag Lenham Beds	Britain
Redonian (Tortonian)	France (N.W.)

Collection—

M.P.G., No. 467.

Fam. PYRAMIDELLIDÆ.

PYRAMIDELLA PLICOSA Bronn. [Plate 3, fig. 14].

Turbo terebellata Brocchi : Conch. Foss. Subapennina, 1814. Vol. 2, p. 383, *non Auricula terebellata* Lamarck.

Pyramidella plicosa Bronn : Lethæa geognostica, 1838, ed. 2, vol. 2, pl. 40, fig. 24, p. 1026.

Distribution—

Red Crag	Britain
Astian Plaisancian	Italy
Coralline Crag Lenham Beds	Britain
Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	Vienna Basin ; Italy ; Denmark ; France (Bordeaux area).

Collection—

B.M. (Graham Wallas).

Fam. EULIMIDÆ.

SUBULARIA SUBULATA Donovan.

Turbo subulatus Donovan : Nat. Hist. Brit. Shells, 1803, vol. 5, pl. 172.

Subularia subulata Tryon : Man. Conchology, 1886, vol. 8, pl. 70, fig

Distribution—

Recent	British and Mediterranean Seas
Astian	Italy ; France (Rousillon)
Plaisancian	
Scaldisian	Belgium
Diestian	
Coralline Crag	Britain
St. Erth Beds	
Lenham Beds	
Anversian	Belgium
Messinian	Germany (N.).
Vindobonian	Vienna Basin; Italy; Holland; Denmark.

Collection—

M.P.G., No. 449.

Fam. TURRITELLIDÆ.

ZARIA SUBANGULATA Brocchi. [Plate 3, figs. 18, 19].

Turbo subangulatus Brocchi : Conch. Foss. Subapennina, 1814, vol. 2, pl. 6, fig. 16, p. 374.

Zaria subangulata Sacco : Moll. Terz. Piemonte, 1895, pt. 19, pl. 1, figs. 30–35, pp. 9–11, with varieties = *Turritella planispira* S. V. Wood, 1848, *non* Nyst, 1845.

Distribution—

Coralline Crag	Britain
Astian	Italy
Plaisancian	Italy ; France
St. Erth Beds	Britain
Anversian	Belgium
Messinian	France (S.W.) ; Germany (N.)
Vindobonian	Italy; Holland; Denmark; Vienna Basin.

Collection—

M.P.G., Nos. 474 ; C.R., 1275–1278.

Fam. XENOPHORIDÆ.

XENOPHORA CRISPA (?) König. [Plate 3, fig. 15].

Trochus crispus König : Icones Fossilium Sectiles, 1825, pl. 5, fig. 58, p. 3.

Xenophora crispa Fontannes : Moll. Pliocénes Rhone Rousillon, 1879–1882, p. 204 (= *Xenophora sp.*, Reid).

Distribution—

Astian	Italy
Plaisancian	France (Rousillon); Italy
Lenham Beds	Britain.

Collection—

M.P.G., Nos. 15879, 475.

Fam. APORRHAIIDÆ.

APORRHAIS PESPELECANI Linnæus.

Strombus pespelecani Linnæus: Syst. Naturæ, 1758, ed. x., p. 742.

Aporrhais pespelicani S. V. Wood: Mon. Pal. Soc., 1848, pl. 2, fig. 4, p. 25.

Distribution—

Recent	British and European Seas
Post-Glacial Norwich Crag Red Crag	Britain
Astian Plaisancian	Italy; France (Rousillon)
Scaldisian Diestian	Belgium
Coralline Crag Lenham Beds	Britain
Anversian	Belgium
Vindobonian	Italy; Vienna Basin.

Collections—

M.P.G., Nos. 441. C.R., 1240–1242.
B.M. (Prestwich).

Fam. CASSIDIDÆ.

SEMICASSIS SABURON Bruguière. [Plate 4, fig. 3].

Cassidea saburon Bruguière: Encyclop. Méth., 1792, vol. 1, p. 420.

Semicassis saburon Tryon: Man. Conchology, 1885, vol. 7, pl. 5, figs. 74–78, p. 275 [=*Buccinum dalei* Reid].

Distribution—

Recent	Mediterranean; Atlantic
Red Crag (derived)	Britain
Astian Plaisancian	Italy
Scaldisian	Belgium
Lenham Beds Box Stones	Britain
Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	Vienna Basin; Denmark; Holland.

Collection—

M.P.G., No. 442.

Fam. FICIDÆ (=PYRULIDÆ).

FICUS RETICULATA Lamarck. [Plate 4, figs. 1, 2].

Pyrula reticulata Lamarck: In Bruguière's Encyclop. Méth., 1816, pl. 432, fig. 2.

Distribution—

Recent	Atlantic (West Indies)
Red Crag (derivative)	Britain
Astian	Italy
Plaisancian	France
Coralline Crag Box Stones Lenham Beds	Britain
Diestian Anversian Bolderian	Belgium
Redonian (Tortonian)	France (N.W.)
Messinian	Germany (N.)
Vindobonian	Vienna Basin; France (S.); Denmark; Holland.

Collections—

M.P.G., Nos. 463; and C.R., 1266–1270.
B.M. (Prestwich, Graham Wallas, and Kennard).

Fam. FUSIDÆ.

STREPTOCHETUS SEXCOSTATUS Beyrich. [Plate 3, figs. 1, 2].

Fusus sexcostatus Beyrich: Zeitsch. Deutsch. Geol. Ges., 1856, vol. 8, pl. 24, fig. 2, p. 73.

Streptochetus sexcostatus Cossmann: Essais Paléoconch. Comparée, 1901, part 4, p. 31 (=*Triton heptagonum* ? and *Fusus lamellosus* Reid).

NOTE.—The specific determination of these remains was made by the late Professor Gottsche, of the Hamburg Museum, who was the chief authority on the North German Miocene Mollusca.

Distribution—

Lenham Beds	Britain
Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	Holland; Denmark.

Collection—

M.P.G., Nos. 451, 469.

Fam. NASSIDÆ.

TRITIA LIMATA Chemnitz.

Buccinum limatum Chemnitz: Conchyl. Cabinet, 1795, vol. xi., pl. 188, figs. 1808, 1809, p. 87 (=*Buccinum prysmaticum* Brocchi, 1814).

Nassa prismatica S. V. Wood: Mon. Pal. Soc., 2nd Suppl., 1879, pl. 1, fig. 6, p. 2, and of Reid.

Distribution—

Recent	Mediterranean Sea, etc.
Scaldisian	Belgium
Astian	Italy
Plaisancian	France (Rousillon)
Coralline Crag Lenham Beds	Britain
Anversian	Belgium
Redonian (Tortonian)	France (N.W.)
Messinian	Germany (N.)
Vindobonian	Vienna Basin; Holland
Burdigalian	France (Dax).

Collections—

M.P.G., Nos. 453; C.R., 1279–1283.
B.M. (Graham Wallas and Kennard).

Fam. MURICIDÆ.

MUREX BADENSIS Nyst. [Plate 3, figs. 23, 24].

Murex (*Ocinebra*) *badensis* Nyst: Ann. Mus. R. Hist. Nat. Belgique, 1881, vol. 3, p. 4 (=*Murex tortuosus* J. de C. Sowerby, 1823, *non* Borson, 1821).

Distribution—

Red Crag	Britain
Scaldisian	Belgium
Coralline Crag	Britain
Vindobonian	Holland.

Collection—

M.P.G., No. 464.

BOREOTROPHON CLATHRATUM Linnæus. [Plate 4, fig. 4].

Murex clathratus Linnæus: Syst. Naturæ, 1767, ed. xii., vol. 1, part 2, p. 1223 (= *Trophon scalariforme* S. V. Wood, 1848, *non* Gould).

Boreotrophon clathratum Fischer: Man. Conchyl., 1884, p. 640.

Distribution—

Recent	British and Arctic-American Seas, etc.
Post-Pliocene	Britain and Northern Europe
Norwich Crag Red Crag Coralline Crag Lenham Beds	Britain
Bolderian	Belgium.

Collection—

B.M. (Kennard).

TROPHONOPSIS MURICATUS Montagu.

Murex muricatus Montagu : Testacea Britannica, vol. 1, 1803, pl. ix., fig. 2, p. 262.

NOTE.—*Trophonopsis* was founded on this type by Bucquoy, Dautzenberg, and Dollfus: Moll. Marins Roussillon, 1882, vol. 1, fasc. 1, pl. 6, fig. 7, pp. 39, 40.

Distribution—

Recent	British and Mediterranean Seas
Post-Pliocene Red Crag }	Britain
Scaldisian	Belgium
Redonian (Tortonian)	France (N.W.).

Collection—

M.P.G., No. 473.

Fam. CANCELLARIIDÆ.

BONELLITIA SERRATA Bronn. [Plate 3, fig. 17].

Cancellaria serrata Bronn : Italiens Tertiär-Gebilde, 1831, p. 44.

Bonellitia serrata Sacco : Moll. Terz. Piemonte, 1894, part 16, pl. 3, figs. 5–10, pp. 43, 44, with varieties (= *Cancellaria contorta* Reid, *non* Basterot).

Distribution—

Plaisancian	Italy
Lenham Beds	Britain
Vindobonian	Italy.

Collection—

M.P.G., No. 444.

Fam. VOLUTIDÆ.

MACULOPEPLUM LAMBERTI J. Sowerby. [Plate 3, fig. 20].

Voluta lamberti J. Sowerby: Mineral Conchology, 1816, vol. 2, pl. 129, p. 65.

NOTE.—*Maculopeplum* was founded by Prof. Dall for Lamarck's *Voluta junonia* (see "The Nautilus," 1906, vol. 19, no. 12, p. 143).

Distribution—

Red Crag	Britain
Scaldisian	Belgium
Coralline Crag Box Stones }	Britain
Diestian	Belgium
Redonian (Tortonian)	France (N.W.)
Vindobonian	France (S.W. and Touraine).

Collection—

B.M. (Graham Wallas).

Fam. TURRIDÆ (=PLEUROTOMIDÆ).

TURRIS TURRIFERA Nyst. [Plate 3, figs. 11–13].

Murex turricula Brocchi: Conch. Foss. Subapennina, 1814, vol. 2, pl. 9, fig. 20, p. 435 (*non* Montagu, 1803).

Pleurotoma turrifera Nyst: Dewalque's "Prod. Desc. Géol. Belgique," 1868, p. 422.

Distribution—

Glacial Red Crag	Britain
Scaldisian	Belgium
Astian Plaisancian	Italy
Lenham Beds	Britain
Diestian Anversian Bolderian	Belgium
Messinian	Germany (N.)
Vindobonian	Vienna Basin; Holland; Denmark.

Collections—

M.P.G., No. 461.

B.M. (Graham Wallas).

DRILLIA OBELISCUS Des Moulins. [Plate 3, figs. 4–6].

Pleurotoma obeliscus Des Moulins: Act. Soc. Linn. Bordeaux, 1842, vol. 12, p. 176 (=*P. consobrina* Reid, *non* Bellardi).

Drillia obeliscus Bellardi: Moll. Terz. Piemonte, 1877, part 2, pl. 3, fig. 28, p. 103 (for comparison ; species not Italian).

Distribution—

Lenham Beds	Britain
Diestian Anversian Bolderian	Belgium
Messinian	Germany (N.)
Vindobonian	Holland ; Denmark
Burdigalian	France (S.W.).

Collections—

M.P.G., No. C.R., 1264.

B.M. (Graham Wallas).

CLAVATULA JOUANNETI Des Moulins. [Plate 3, figs. 9, 10].

Pleurotoma jouanneti Des Moulins : Act. Soc. Linn. Bordeaux, 1843, vol. 12, pp. 143, 144.

Clavatula jouanneti Bellardi: Moll. Terz. Piemonte, 1877, part 2, pl. 6, fig. 25, p. 199.

Distribution—

Lenham Beds	Britain
Vindobonian	France; Italy; Vienna Basin
Burdigalian	France.

Collections—

M.P.G., No. 460.
B.M. (Graham Wallas).

Fam. TEREBRIDÆ.

TEREBRA ACUMINATA Borson. [Plate 3, fig. 16].

Terebra acuminata Borson: Mem. R. Accad. Sci. Torino, 1820, vol. 25, pl. 1, fig. 17. p. 224.

Distribution—

Astian Plaisancian	Italy
Lenham Beds	Britain
Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	Italy; Vienna Basin; Holland.

Collections—

M.P.G., No. 468.
B.M. (Graham Wallas).

Fam. ACTÆONIDÆ.

ACTÆON TORNATILIS Linnæus.

Bulla tornatilis Linnæus: Syst. Naturæ, 1758, ed. x., p. 728.

Actæon tornatilis S. V. Wood: Mon. Pal. Soc., 1848, pl. 19, fig. 5, p. 170.

Distribution—

Recent	British and Mediterranean Seas; Atlantic
Norwich Crag Red Crag	Britain
Astian Plaisancian	Italy
Scaldisian	Belgium
Coralline Crag Lenham Beds	Britain
Diestian Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	Vienna Basin; Denmark; Holland.

Collections—

M.P.G., No. 440.
B.M. (Graham Wallas).

Fam. RINGICULIDÆ.

RINGICULELLA LENHAMENSIS sp. nov. [Plate 3, figs. 21, 22].

Ringicula ventricosa var. Reid : Mem. Geol. Surv. United Kingdom, 1890, p. 255, *non* J. de C. Sowerby.

Diagnosis—

Testa ovato-elongata vel subcylindracea, lævigata ; spira acuta, conoidea ; anfractibus 5–6, subinflatis ; suturis canaliculatis ; columella infra biplicata ; labro marginato, non crenato ; basi emarginata.

Dimensions—

Length	9 to 11 millimetres
Diameter	5 to 7 „

Remarks—

This fossil, besides being referred to by Mr. Reid as a "gigantic variety" of *Ringicula ventricosa*, was further recognised as "perhaps new species."

It is an unusually large example of the Ringiculidæ, and appears to differ in this way from other forms of the family, as well as in its more or less cylindrical contour, the possession of an elongate and nearly parallel-sided body-whorl, and the presence of a generally smooth surface throughout, only obscure longitudinal markings being visible without any evidence of spiral striations. The species should not be confused with Sowerby's *R. ventricosa*, which is of smaller size, different contour, and moreover spirally ornamented. It differs also from the recent *Marginella auriculata* of Ménard (= *Voluta buccinea* Brocchi), which may be either smooth or furnished with distant obsolete spiral sculpture, besides being of larger dimensions and having a relatively narrower longitudinal axis. The absence of crenulations on the inner surface of the outer lip would suggest, however, that this fossil had certain affinities with the modern species, such forms being included in Sacco's [1]genus *Ringiculella*, which was founded on Ménard's shell from the Mediterranean, previously quoted. The largest specimen, as explained by a gutta-percha model, exhibits both a dorsal and ventral view, the latter giving details of the aperture, although the columellar plications are obscure, these being better expressed in a smaller example.

Distribution—

Lenham Beds	Britain.

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[1] Moll. Terz. Piemonte, 1892, part 12, pp. 16—33.

Collections—

M.P.G., No. 465.
B.M. (Prestwich).

Fam. SCAPHANDRIDÆ.

SCAPHANDER LIGNARIUS Linnæus.

Bulla lignaria Linnæus: Syst. Naturæ, 1758, ed. x., p. 727.

Scaphander lignarius De Montfort: Conchyl. Syst., 1810, vol. 2 p. 335.

Distribution—

Recent	British and Mediterranean Seas; Atlantic
Red Crag	Britain
Scaldisian	Belgium
Astian	Italy
Plaisancian	
Coralline Crag	Britain
Lenham Beds	
Diestian	Belgium
Anversian	
Bolderian	
Redonian (Tortonian)	France (N.W.)
Messinian	Germany (N.)
Vindobonian	Vienna Basin; Italy; Denmark; Holland.

Collections—

M.P.G., Nos. 443; C.R., 1243–1252.
B.M. (Prestwich; Graham Wallas; Kennard).

BULLINELLA CYLINDRACEA Pennant.

Bulla cylindracea Pennant: British Zoology, 1776, vol. 4, pl. 70 fig. 85, p. 117.

Bullinella cylindracea Sacco: Moll. Terz. Piemonte, 1897, part 22, pl. 4, figs. 7–10, p. 49.

Distribution—

Recent	British and European Seas
Red Crag	Britain
Scaldisian	Belgium
Astian	Italy
Plaisancian	
Coralline Crag	Britain
Lenham Beds	
Diestian	Belgium
Anversian	

Redonian (Tortonian)	France (N.W.)
Messinian	Germany (N.)
Vindobonian	Italy; Holland; Denmark.

Collection—

B.M. (Graham Wallas).

Scaphopoda.

Fam. DENTALIIDÆ.

DENTALIUM ENTALE Linnæus.

Dentalium entalis Linnæus : Syst. Naturæ, 1758, ed. x., p. 785.

Distribution—

Recent	British and Mediterranean Seas
Post-Glacial Norwich Crag	Britain
Scaldisian	Belgium
Plaisancian	France (Rousillon, etc.)
Lenham Beds Box Stones	Britain
Diestian Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	Vienna Basin; Holland.

Collections—

M.P.G., No. 447.

B.M. (Graham Wallas).

Pelecypoda.

FAMILIES—

Nuculidæ.
Nuculanidæ.
Anomiidæ.
Arcidæ.
Glycymeridæ.
Mytilidæ.
Pteriidæ (=*Aviculidæ*).
Ostreidæ.
Pectinidæ.
Carditidæ.
Astartidæ.
Cyprinidæ.
Lucinidæ.
Tellinidæ.
Mactridæ.
Veneridæ.
Cardiidæ.
Solenidæ.
Saxicavidæ.
Pholadidæ.
Teredinidæ.
Anatinidæ.

Fam. NUCULIDÆ.

NUCULA PROXIMA Say.

Nucula proxima Say: Journ. Acad. Nat. Sci. Philadelphia, 1822, vol. 2, part 2, p. 270 (not figured).

Nucula trigonula S. V. Wood : Mag. Nat. Hist. (Charlesworth), 1840, N.S., vol. 4, pl. 14, fig. 3, p. 295.

Distribution—

Recent	American Seas
Post-Pliocene	United States
Coralline Crag	Britain
St. Erth Beds	
Anversian	Belgium
Miocene	United States.

Collections—

M.P.G., No. 430.
B.M. (Graham Wallas).

NUCULA cf. SULCATA Bronn.

Nucula sulcata Bronn: Italiens Tertiär-Gebilde, 1831, p. 109.

Distribution—

Recent	Mediterranean
Astian	Italy
Plaisancian	
St. Erth Beds	Britain
Lenham Beds	
Vindobonian	Italy.

Collection—

M.P.G., No. 430 (associated with *Nucula proxima*).

Fam. NUCULANIDÆ.

YOLDIA OBLONGOIDES S. V. Wood. (Plate 2, figs. 18–20).

Nucula oblongoides S. V. Wood: Mag. Nat. Hist. (Charlesworth) 1840, N.S., vol. 4, pl. 14, fig. 4, p. 297 (=*Leda myalis* S. V. Wood *non* Couthouy).

Distribution—

Post-Pliocene	Britain.
Norwich Crag	
Red Crag	
Lenham Beds	

Collections—

M.P.G., Nos. 426, 436.
B.M. (Prestwich; Graham Wallas).

Fam. ANOMIIDÆ.

MONIA PATELLIFORMIS Linnæus.

Anomia patelliformis Linnæus: Syst. Naturæ, 1767, ed. xii., vol. 1, part 2, p. 1151.

Distribution—

Recent	British and Scandinavian Seas
Post-Pliocene	Britain
Norwich Crag	
Red Crag	

Astian Plaisancian	Italy
Coralline Crag Lenham Beds	Britain.

Collection—

M.P.G., No. 403.

Fam. ARCIDÆ.

ANADARA DILUVII Lamarck. [Plate 2, fig. 8].

Arca diluvii Lamarck: Ann. Mus. Hist. Nat. (Paris), 1805, vol. 6, p. 219.

Distribution—

Plaisancian	France; Italy
Lenham Beds	Britain
Anversian Bolderian	Belgium
Messinian	France (Bas Dauphiné, recorded by H. Fontannes)
Vindobonian	France; Germany; Italy; Vienna Basin; Holland.

Collections—

M.P.G., No. 410.

B.M. (Prestwich; Graham Wallas).

FOSSULARCA LACTEA Linnæus.

Arca lactea Linnæus: Syst. Naturæ, 1758, ed. x., p. 694.

Fossularca lactea Sacco: Moll. Terz. Piemonte, 1898, part 26, plate 3, figs. 20–23, p. 19.

Distribution—

Recent	British and Mediterranean Seas
Post-Pliocene	Britain
Astian	Italy
Plaisancian	France (S.); Italy
Red Crag Coralline Crag Lenham Beds	Britain
Redonian (Tortonian)	France (N.W.)
Vindobonian	Italy; Vienna Basin.

Collection—

B.M. (Prestwich; Graham Wallas).

Fam. GLYCYMERIDÆ.

GLYCYMERIS PILOSA Linnæus.

Arca pilosa Linnæus: Syst. Naturæ, 1767, ed. xii., vol. 1, part 2, p. 1143.

Glycymeris pilosa R. B. Newton: Records Albany Museum, 1913 vol. 2, no. 5, pl. 19, figs. 3–5, p. 333.

Distribution—

Recent	Mediterranean
Scaldisian	Belgium
Astian	Italy
Coralline Crag	Britain
St. Erth Beds	
Lenham Beds	
Box Stones	
Diestian	Belgium
Anversian	
Redonian (Tortonian)	France (N.W.)
Messinian	Germany N.
Mio-Pliocene	South Africa
Vindobonian	Italy; Holland; Vienna Basin.

Collections—

M.P.G., Nos. 401 (associated with *Hinnites crispus*), 431.
B.M. (Prestwich; Graham Wallas).

Fam. MYTILIDÆ.

MYTILUS EDULIS Linnæus var. UNGULATUS Poli.

Mytilus edulis Linnæus: Syst. Naturæ, 1758, ed. x., p. 705.

Mytilus ungulatus Poli: Testacea utriusque Siciliæ, 1795, vol. 2, pl. 32, fig. 5, p. 208.

Distribution—

Recent	Mediterranean
Red Crag	Britain.
Lenham Beds	

Collection—

M.P.G., No. C.R., 1256.

VOLSELLA BARBATA Linnæus. [Plate 4, fig. 11].

Mytilus barbatus Linnæus: Syst. Naturæ, 1758, ed. x., p. 705.

Distribution—

Recent	British and Mediterranean Seas
Red Crag	Britain
Plaisancian	France (S.)
Lenham Beds	Britain.

Collection—

B.M. (Graham Wallas).

(*To be continued*).

NOTES ON HELIX PISANA Müller
AND ITS OCCURRENCE AT PORTHCAWL.

By J. DAVY DEAN,
Of the Department of Zoology, National Museum of Wales.

(Read before the Society, May 10th, 1916).

At the meeting of this Society held November 10th, 1915, I exhibited a series of *Helix pisana* collected in October by Mr. H. M. Hallett and myself at Porthcawl, and we were then under the impression that this was the first genuine record of the species for Glamorgan. Dr. Gwyn Jeffreys' attempt to introduce it at Swansea, and his failure to establish a colony, is well known. There does not seem to be any further mention of the species for the county until the [1]account by the Rev. Dr. A. H. Cooke of finding it in August, 1915, at exactly the same point on the dunes as we did.

It is extraordinary that two records, made independently, should coincide like this, and yet prove the first for a species with such "careless" habits, for *Helix pisana* makes no effort to conceal itself. Dr. Cooke states that it seems obvious that the species has been introduced by the agency of man within the last few years. I am inclined to think that the colony is in every way a natural one, and I will give my reasons.

The most likely source for information in regard to the supposed introduction of the species would be a study of the "past life" of local naturalists. Dr. Gwyn Jeffreys may be acquitted, for he would in all probability have recorded the fact. Mr. F. W. Wotton did not take the species at this locality or there would be some evidence in his extensive collection at the National Museum of Wales. Mr. Charles Jefferys, of Bath, can give me no information, and I have been unable to find a culprit among other local collectors. So far there is no positive evidence of introduction.

Dr. Cooke's only reference to the habitat characteristics is his term "herbage." The burrows at Porthcawl, although extending for a distance of two miles, do *not* offer a suitable habitat throughout for *Helix pisana*. This suitable flora may be described as the *Diplotaxis tenuifolia* association: associated species *Senecio jacobæa*, *Erodium cicutarium*, etc. Where this flora begins and ends so also does the *H. pisana* habitat begin and end. There is a margin beyond where it may be taken on the marram grass, but the pure marram grass dunes do not give *pisana*. Whoever introduced the species was not only careful to introduce the flora association, but also the full molluscan association, *Helicella barbara* L., etc.

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[1] Proc. Malac. Soc., vol. xii., p. 4.

Mr. J. W. Taylor in his notes on ***Hygromia umbrosa*** Partsch and its occurrence on British soil cautions us all against the too ready acceptance of the theory of introduction of a species by artificial means. At Saundersfoot, near Tenby, where the variety ***menkeana*** occurs almost to the exclusion of the type, the area occupied by *H. pisana* is even smaller than at Porthcawl, but nevertheless the species is there in extraordinary abundance. This is another instance of a locality never properly recorded. Mr. A. G. Stubbs says only:—"Odd specimens of *H. pisana* have also turned up at Saundersfoot" (*Journ. of Conch.*, vol. 9, p. 327), and in Mr. Taylor's Monograph we read "Occasionally found at Saundersfoot, but was found plentifully there in 1883, on a piece of sandy ground not far from the sea, by Mr. C. Jefferys." It was also found in profusion by Mr. Edward Collier in 1900. There is no doubt that were it possible to work right along the coast-line from Pembrokeshire to Glamorgan similar detached colonies would be found connecting the three counties, Pembroke, Carmarthen, and Glamorgan.

◆

Paludestrina jenkinsi in Carnarvonshire.—*Paludestrina jenkinsi* occurs, although hardly in its usual abundance, in the marshes below Ynyscynhaiarn Church, near Criccieth. Specimens which I collected—some fifty in number—in September, 1911, were all referable to the var. *aculeata*, the form with strong spines at rather wide intervals on the keel. Associated with the *Paludestrina* were *Limnæa peregra*, *Planorbis crista*, and *Pisidium casertanum*.—CHAS. OLDHAM (*Read before the Society*, Dec. 8th, 1915).

Resemblance of the Cocoons of Talæporia tubulosa to Clausilia bidentata.—While collecting *Clausilia* on the trunks of beeches on Westwell Beacon, last August, I occasionally at first sight mistook certain cocoons for *Clausilia bidentata*. They were placed on the trunks in exactly the same position as that in which *Clausilia* climbs. Some of these cocoons I submitted to Mr. Alfred Sich, F.E.S., who informs me that they are those of *Talæporia tubulosa* Retzius, a lepidopterous insect belonging to the family *Psychidæ*. Though this cannot be a case of mimicry, the resemblance is interesting.—A. J. ARKELL (*Read before the Society*, November 10th, 1915).

◆

ADDITIONS TO "BRITISH CONCHOLOGY."

By J. T. MARSHALL.

PART VII. *(continued from p. 47).*

R. membranacea Ad.—Besides having the "pillar furnished near its base with a strong tooth-like projection or fold" (Jeffreys), it seems to have escaped notice that aged specimens, especially of the coarser forms, develop a tooth-like callosity inside the base of the aperture, and more frequently a third one inside the outer lip just below its junction with the pillar.

var. **venusta** Phil.—Torbay. The so-called varieties *ventricosa* and *oblonga* occur on our coasts.

Adams' type of *R. membranacea* is supposed to have been the estuarine form (var. *elata* Phil.), and *R. labiosa* Mont. to have been the marine one. But Adams' description is not quite clear, and his bad figures no guide; hence writers have disregarded what could only be guesswork. Forbes and Hanley adopted *R. labiosa* Mont., but mixed up the two forms; while Jeffreys, who pronounced for *R. membranacea* Ad., adopted the marine form, and gave the local variety *elata* secondary place. The brackish-water form is altogether unsuitable, as not being the type of a true species, viz., a really typical shell. It is in the same category as *Hyalinia pura* var. *margaritacea*, *Tellina balthica* var. *attenuata*, *Lacuna puteolus* var. *expansa*, etc.

R. violacea Desm.—It has been stated that *R. violacea* is "exclusively Mediterranean,"[1] and that the British shell so-called must be re-named *R. lilacina* Récluz. It is true the "exclusively Mediterranean" form of *R. violacea*, like many other Mediterranean species, is different from the British one, being a more slender and delicate shell. Their specific characters, however, are the same, and they do not need separate names.

R. costulata Ald.—Off Loch Ryan, 20f., a fresh specimen. Previously recorded from Lamlash, with a doubt, by Jeffreys.

A semi-costate form from Torbay can hardly be separated from some of the Mediterranean forms of *R. similis*. The latter species differs from *R. costulata* in being more oblong, the ribs do not extend so far to the base, and the outer lip is not thickened by a varicose rib.

According to Monterosato,[2] Alder's name is a year subsequent to *R. guerini* Récluz (1843). Not *R. costulata* Risso (1826), which is *R. variabilis* Mühlf. Nor *R. costulata* S. Wood, which is *R. stefanisi* Jeffreys.

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[1] Dautzenberg and Durouchoux: "Moll. S. Malo," Feuille des Jeunes Nat., 1913.

[2] Nomenclatura, p. 56.

R. striata A. Ad.—The Rev. R. Boog Watson has noticed that the surface of this shell is covered by a "delicate microscopic spiral fretting," similar to that which adorns *R. aëdonis* Wats.

var. **aculeus** Gould.—From a raised beach in Skye (Scott) !

R. proxima Ald.—Clyde, 20f. ; Davar Island, 26f. ; Sanda Island, 25f. ; and Mull of Cantire, 55f. (Knight) ! Achil Island ; off Loch Ryan, 25-28f. ; ten miles south of Arran, 60f. Most of the Hebridean specimens belong to a small and slender form.

R. vitrea Mont.—Clyde mouth, 20f. ; off Loch Ryan, 25f.

R. pulcherrima Jeff.—Alderney (Marquand) !

var. **pellucida** Marsh.—*R. amabilis* Monts. does not appear to me distinct from this variety. The former is a more slender form of the type, with the whorls more convex, and is found occasionally in the Channel Islands. Jeffreys' figure well represents this form in outline.

R. fulgida Ad.—Skipness, at the mouth of Loch Fyne, living in corallines (Somerville) ! off Loch Ryan, 27f., two dead specimens.

R. obtusa Cant.—Some specimens from the Adventure Bank, dredged in the 'Porcupine' Expedition, are regularly ribbed with longitudinal lines of growth, in the same manner as I have related of *Odostomia acicula* from the same locality.[1] Another extreme form is more conical, approaching in outline *R. triangularis* Watson, a minute shell, by the way, that must have puzzled Gwyn Jeffreys, as he described it in the 'Porcupine' Report as a *Trochus* (*minutulus*), but from an examination of specimens, figures, and text, I am satisfied they are one and the same species.

R. semistriata Mont.—Mull of Cantire, 19f.

var. **pura** Jeff.—Benbecula. A specimen from the Mediterranean has longitudinal riblets, which dominate the spiral striæ. *R. galvagni* of Aradàs is the dwarf form of this species.

R. cingillus Mont.—Benbecula. Two specimens from Alderney, collected by Mr. Marquand, are of a uniform dark purple, without bands.

Hydrobia Hartm.—One of the recommendations of the International Zoological Congress—an authority which, if any, is the most likely to endure, and at any rate one which cannot be ignored—laid down that it was "well to avoid the introduction of new generic names which differ from those already in use only in termination, or in a slight variation in spelling, which may lead to confusion ; but, when once introduced, such names are not to be rejected on this account."

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[1] *Journ. of Conch.*, 1900, vol. ix., p. 336.

H. ulvæ Penn. is one of the shuttlecocks of conchology, no end of varieties, species, and even genera having been manufactured from the type and its var. *minor*.

var. **minor** Marsh.—Gwyn Jeffreys writes that "*Turbo minutus* of Totten, which inhabits similar situations [to our var. *minor*] on the western coasts of North America, and which I found plentifully on the sea-board of Canada and New England, appears to be a different species."[1]

H. ventrosa Mont.—The record of this species from Sanda Island, Clyde, in 19 fathoms, given in the Scottish Fishery Board Report for 1898, is very doubtful, even if attributable to a solitary specimen possibly washed out to sea. It is far more likely to be *H. ulvæ*, and not improbably of the var. *barleei.*

Retrotortina fuscata Chast.[2]—A specimen of a minute shell described under this name was dredged in the Royal Irish Academy Cruise of 1886 at Lough Hyne in the south-west of Ireland.

Homalogyra rota F. and H.—Forbes and Hanley mention, as does Jeffreys, the carinations on this shell, but neither author exhibits them in the figures.

var. **tricarinata** Webster.—On a new British species of *Skenea*, Ann. Mag. N. Hist., vol. xviii., p. 156, pl. viii., fig. 12, 13; and vol. xix., p. 269 = *H. rota* var. *fischeriana* Monterosato, Journ. Conchyl., 1869, p. 274, pl. 13, fig. 1.—This variety was originally found by Mr. Webster "among *Corallina officinalis* at Gwyllyn Vase, Falmouth." A search among my *Homalogyra*, taken from the same habitat many years ago, resulted in two more specimens being brought to light. I have it also from Jersey, Guernsey, Connemara, and Sligo, and a specimen was dredged in Lough Hyne, S.W. Ireland, during the R.I.A. cruise. It differs from the type in the ring-like sculpture being absent. Mr. Webster's figures, unfortunately, are of little use as a guide. Gwyn Jeffreys merely cites the name,[3] apparently not deeming it worthy to rank as a variety; but I think it deserves equal recognition with *H. atomus* var. *polyzona* Brus., which is analogous.

Cæcum glabrum Mont.—The extra-British distribution of this species requires confirmation, as it has been mixed up both with *C. lævissimum* Cant. and *C. subannulatum* De Folin. The latter differs from *C. glabrum* in having slight and shallow ringed sculpture, while *C. lævissimum* is several times larger.

(To be continued).

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[1] Proc. Zool. Soc., 1884, part vii., p. 128.

[2] Journ. Malac., 1906, vol. v., p. 2, pl. i., figs. 5—6; Proc. Irish. Acad., 1898, vol. v.

[3] Brit. Conch., vol. iv., p. 73.

NOTE ON TRICHOTROPIS ANTARCTICA Melv. & St. (non Thiele).

BY J. COSMO MELVILL, M.A., D.SC., AND R. STANDEN.

(Read before the Society, October 16th, 1915).

IN August, 1912, we published description,[1] with figure, of an interesting new *Trichotropis* from the South Orkney group ("Scotia" Expedition), and, since publication, discovered that, also in August of the same year, Dr. Thiele of Berlin[2] described under the identical name (*antarctica*) a quite different species of the same genus.

We are uncertain which name has priority, but, as our description was issued during the last week of August, it is probable that it will have to yield, in the matter of antedating.

Accordingly, we propose to change the name to ***bruceana***, after Dr. W. S. Bruce, the energetic leader of the Scottish National Antarctic Expedition.

We also take this opportunity of mentioning that another species described by us,[3] *Tugalia antarctica*, was antedated by one of the same genus, a very similar species, being thus named in the same year (1907) by Dr. Hermann Strebel of Hamburg. Dr. Thiele,[4] perceiving this, has re-named our species *T. melvilli.*

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EDITORIAL NOTES.

The Annals of the Natal Museum, vol. iii., part 2, Oct., 1915, contains an admirable paper of 150 pages, with 18 plates, entitled "Studies on the Carnivorous Slugs of South Africa," by Hugh Watson, M.A. It opens with a history of the genus *Apera*, and then gives an exhaustive account of the external and internal structure, followed by a systematic monograph of the six species now known, and a chapter on their phylogeny. This genus is only known to inhabit the maritime provinces of South Africa, and none of the species are common.

Mr. Watson next elucidates the occurrence of *Testacella maugei* at Cape Town, and from an appendix on its synonymy we gather that it has been described as a recent species under nine or ten names, while there are ten fossil species which may very possibly be referable to it. He goes on to discuss in an extremely interesting chapter the evolution of carnivorous characters, and the important modifications which may be produced both in shell characters and in anatomy by the acquisition of carnivorous habits.

Mr. Watson comes to the conclusion that most of the carnivorous genera of slugs "have been derived independently from different snails by the parallel degeneration of the shell"—*Apera* coming from the northern *Rhytididæ*, and *Testacella* from the European *Oleacinidæ*, so that the resemblance between these two genera is merely another example of convergence. He would, therefore, restrict *Agnatha* as a group to contain the *Oleacinidæ* and *Testacellidæ*, and adopt Pilsbry's term *Agnathomorpha* for the group consisting of *Aperidæ*, *Rhytididæ*, and *Streptaxidæ*.

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[1] Trans. Royal Soc., Edin., xlviii., pt 2 (No. 18), p. 348, plate fig. 7 (1912).

[2] J. Thiele, Deutsche Südpolar Exped., xiii., Zool., v. Band, Heft ii., p. 197, Tafel xii., fig. 6 (1912).

[3] Trans. Royal Soc., Edin., xlvi., pt. 1 (No. 5), p. 128, plate fig. 1 (1907).

[4] J. Thiele, l.c. p. 257 (1912).

With reference to the publication of Rimmer's "Land and Freshwater Shells" (v. supra p. 52), Mr. John Grant, of George IV. Bridge, Edinburgh, informs me that he published a reprint of the original edition in 1907, and that this reprint is still in stock.

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CENUS AUTHENTICATIONS.

BY W. DENISON ROEBUCK, M.Sc., F.L.S., HON. RECORDER.

All the records here given are based upon examples submitted to the official authenticators: myself for slugs only; Mr. F. Taylor for *Paludestrinidæ*; and Mr. John W. Taylor for all other species.

Anglesea: Mr. E. D. Marquand has submitted several examples of *Paludestrina stagnalis* from Holyhead.

Berkshire: Mr. W. Holland has presented to the Voucher Collection a few fine *Aplexa hypnorum* from a tiny stream in Pepper Lane, Reading, and a number of small examples from a brook at Three Mile Cross, near Reading.

Carnarvonshire: Mr. C. Oldham has submitted three examples of *Zonitoides excavatus* and one young *Sphyradium edentulum* which he collected at Clynnog Fawr on the 29th Jnly, 1915. He has also sent, and presented to the Voucher Collection—*Planorbis albus* from the River Soch at Llanengan, several, 3rd October, 1914; two *Sphærium corneum* and three *Pisidium subtruncatum* from Llangian, 7th October, 1914; several *Succinea elegans* from Nevin, 27th September, 1914; two *Pupa anglica* from Porth Oer, Aberdaron, 4th October, 1914, and one from Nevin, 30th September, 1914; and a few *Helicella acuta* with two var. *strigata* from Porth Dinlleyn, Nevin, 28th September, 1914.

Channel Islands: Mr. E. D. Marquand has submitted a few examples of *Planorbis crista* taken by himself in Guernsey; and a few *Ovatella bidentata* from Alderney.

Cheviotland: Mr. A. M. Oliver has presented to the Voucher Collection an example of *Acanthinula aculeata* turned up after much search in Hermitage Woods, Warkworth, 16th August, 1913; and one of *Pisidium henslowanum* found along with *P. amnicum* in the Coquet, near Warkworth, June, 1910.

Cornwall East: Mr. J. H. Adams has submitted an example of *Cæcilioides acicula*, obtained on the cliff above Portnadler Bay; some *Hygromia hispida* from the sand-swept cliff at Seaton Beach; a couple of *Vertigo antivertigo* found in a marsh in the Hessenford Valley—all near Looe; also *Zonitoides excavatus* and var. *vitrina*, which are equally common in a small wood not far from Doublebois just off the main Bodmin Road, three-and-half miles west of Liskeard.

Cornwall West: Mr. E. D. Marquand has presented to the Voucher Collection the specimen of *Helicigona arbustorum* which he took in May, 1880, in a deep gully on the coast near Morvah, about six miles north-west of Penzance.

Cumberland: The Rev. W. Wright Mason submitted a half-grown typical example of *Limax flavus* which he took at Penrith, 20th April, 1915. He has also sent fine examples of *Pisidium obtusale*, and of *P. fontinale*, both taken at

Addingham, 11th August, 1915; the determination of these has been concurred in by Mr. B. B. Woodward.

Capt. W. J. Farrer has submitted examples of *Sphyradium edentulum* and of *Acicula lineata* of the *polita* form and its var. *alba*, all from Bassenthwaite.

Denbighshire with Llandudno Peninsula: Mr. H. Beeston has recently sent examples of *Planorbis albus* which he took along with *Pl. spirorbis* at Llandudno in August, 1915.

Mr. C. Oldham has presented to the Collection *Arion intermedius* from the Eglwyseg Rocks near Llangollen, taken 14th September, 1915; also examples of *Physa fontinalis*, *Planorbis albus*, *Valvata cristata*, *Sphærium corneum*, *Pisidium amnicum*, *P. henslowanum* and *P. subtruncatum*, all from the Shropshire Union Canal at Llangollen, same date.

Devon North: Mr. C. Upton has presented to the Voucher Collection two *Aplexa hypnorum* and three *Planorbis umbilicatus* from Instow Marsh.

Dorsetshire: Mr. R. D. Good has sent several additional records—*Hyalinia alliaria*, one from Bockhampton near Dorchester; *Zonitoides nitidus*, three from Frome Whitfield near Dorchester; one *Helicella cantiana* from Bockhampton; and several *Aplexa hypnorum* from the River Frome, and from Hemingston near Dorchester.

Mr. E. D. Marquand has submitted several examples of *Paludestrina ventrosa* taken in 1896 at Weymouth.

Mr. E. W. Swanton has submitted for inspection the example of *Valvata cristata* which he took at Gillingham in July, 1905.

Essex South: Mr. R. A. R. Priske found a nearly adult example of *Limax cinereo-niger*, strictly typical, in Epping Forest, near Loughton, on the 16th October, 1915; it was under the bark of a fallen tree.

Galway South-East: Mr. G. Fysher took a number of slugs and snails in the neighbourhood of Mount Shannon, including the following on the shores of Lough Derg, 20th May, 1915: one *Succinea elegans*, several each of *Valvata piscinalis* var. *antiqua*, *Limnæa pereger* and *L. palustris* and its var. *elongata*. These are all in the Voucher Collection.

Glamorgan: Dr. Hoyle has sent for authentication the following from the F. W. Wotton Collection preserved in the National Museum of Wales: *Testacella scutulum*, one; *Opeas goodallii*, two; and *Azeca tridens*, one, all from Cardiff; and one *Hygromia fusca*, from Llandaff.

Gloucester East: Mr. C. Upton has presented to the Voucher Collection: *Testacella maugei*, a couple from a garden in St. Paul's Road, Gloucester; *Sphærium lacustre*, two from the east bank of the Thames and Severn Canal at Chalford; one *Unio tumidus* from the Stroudwater Canal; a few *Helicella gigaxii* (*heripensis*) from Slad Road, Stroud; a number of *Hyalinia radiatula* from a bog at Elcombe near Stroud; a number of *Planorbis fontanus* from Damsels' Mill-Pond near Painswick; and a number of *Pisidium milium* from a pond near Stonehouse.

Gloucester West: Mr. C. Upton has presented to the Voucher Collection a few examples of *Paludestrina jenkinsi* from the Gloucester and Berkeley Canal near Moreton Valence; one *Unio pictorum* from the Stroudwater Canal; and *Physa heterostropha* from the canal and docks at Sharpness, where it is abundant.

Hants South: Mr. J. E. Cooper has submitted a few examples of *Hyalinia radiatula* from Chark Common.

Kent East: Mr. A. J. Arkell in May, 1915, sent examples of *Limax arborum* and *Arion subfuscus* from Westwell Beacon near Ashford.

PROCEEDINGS OF THE
CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

449th Meeting, held at the Manchester Museum, Feb. 9th, 1916.

The President in the chair.

Additions to the Library announced and thanks voted:—

"New Freshwater Shells from the Ozark Mountains," by A. A. Hinkley (*from the author*); and the usual periodicals received in exchange.

Donations to the Voucher Collection announced and thanks voted:—

Per the Hon. Recorder.

Dreissensia polymorpha, Warkworth, Cheviotland, dead, single valve from shore: A. M. Oliver.

Helix aspersa, *Helicella itala*, Naas, Kildare: G. Fysher.

Helicella virgata, The Curragh, Kildare: G. Fysher.

Helix aspersa, *Helicella itala*, *H. caperata*, *Succinea putris* and *Clausilia bidentata*, Mount Mellick, Queen's Co.: G. Fysher.

Helix aspersa, *Hygromia rufescens*, *Helicella virgata* and var. *albicans*, and *H. acuta*, Howth, co. Dublin: G. Fysher.

Pisidium amnicum, *Bythinia tentaculata*, *Planorbis carinatus*, and *Neritina fluviatilis* var. *trifasciata*, Lough Derg, near Mount Shannon, Galway S.E., beach shells: G. Fysher.

Helix aspersa, *Hygromia rufescens*, *Pyramidula rotundata*, and *Pupa cylindracea*, Llanfairfechan, co. Carnarvon: G. Fysher.

Helix nemoralis var. *rubella* 00300, Mount Shannon, Galway S.E.; *Helix nemoralis* var. *libellula* 12345, (12345); and var. *carnea* 12345, Lahern Cross, Kerry North: G. Fysher.

Testacella scutulum, garden at Lakefoot, Reading, Berks.: J. R. le B. Tomlin.

Paludestrina jenkinsi, Elstree, Herts.: A. E. Boycott.

Helicella virgata var. *albicans*, Llanddwyn Island, Anglesey: C. Oldham.

Clausilia bidentata, Mount Shannon, Galway S.E.: G. Fysher.

Hyalinia radiatula, Doonas Rapids on Shannon, co. Clare: G. Fysher.

Clausilia bidentata, Powerscourt, co. Wicklow: G. Fysher.

Neritina fluviatilis, *Bythinia tentaculata*, *Limnæa pereger*, *Clausilia bidentata*, *Pupa cylindracea* and var. *curta*, co. Clare, Doona Rapids on Shannon: G. Fysher.

Hyalinia lucida, *H. cellaria*, *Pyramidula rotundata*, *Hygromia rufescens*, *Hyg. granulata*, Mylor, Cornwall West: W. Denison Roebuck.

Helicella itala, Monasterevan, co. Kildare: G. Fysher.

Helicella itala and *Hygromia rufescens*, Saggart, Rathcoole, co. Dublin: G. Fysher.

Hygromia hispida, Monasterevan, co. Kildare: G. Fysher.

Pyramidula rotundata, *Clausilia bidentata*, and *Hyalinia nitidula*, Trefusis Point, Flushing, Cornwall West: W. Denison Roebuck.

Helicella acuta and *H. virgata*, Lizard Point, Cornwall West: W. Denison Roebuck.

Clausilia bidentata, *Hyalinia nitidula*, *H. cellaria*, *H. cellaria* var. *scharffi*, *Hygromia hispida*, *Helicella virgata*, *Pyramidula rotundata* and *Pupa cylindracea*, St. Just-in-Roseland, Cornwall East: W. Denison Roebuck.

Helicella caperata, *Hygromia rufescens*, *Hyg. granulata*, *Hyalinia alliaria*, *Pyramidula rotundata*, and *Pupa cylindracea*, Coverack, Cornwall West: W. Denison Roebuck.

Hyalinia alliaria, Cwm Wood, Aberystwith, co. Cardigan: T. H. Platt.

Helix nemoralis var. *carnea* 1(23)45 with extremely thin band 1, Mount Mellick, Queen's Co.: G. Fysher.

Pyramidula rotundata, *Hyalinia cellaria*, *H. alliaria*, and *Ancylus fluviatilis*, Melmerby, Cumberland: Rev. W. Wright Mason.

Pupa secale, *Zua lubrica*, *Hyalinia cellaria*, *Hygromia hispida*, *Pupa cylindracea*, *Pyramidula rupestris*, and *Helix arbustorum*, Melmerby Scar at 1,600 feet altitude, Cumberland: Rev. W. Wright Mason.

Donations to the Autograph Collection announced and thanks voted:—

By E. D. Bostock: Hubert Elgar, J. W. Vaughan, A. Bavay, Silas C. Wheat, and Clement Fielding.

Member Deceased.

John Hill, Little Eaton, near Derby.

Papers Read.

"Note on the Preservation of Land Shells," by B. R. Lucas.

"*Rossia macrosoma* in Carnarvonshire," by Chas. Oldham.

"*Mactra stultorum* monstr. nov.," by Dr. W. G. N. van der Sleen.

The Government Proposal to Close Museums until the Conclusion of the War.

The following resolution was passed unanimously, and copies were forwarded to the Prime Minister and to the Secretary of the Museums Association:—

"Resolved:—

"That the members of the Conchological Society of Great Britain and Ireland at a meeting held on February 9th, 1916, at the Manchester Museum, desire to enter an emphatic protest against the proposal of the Government to close the National Museums and Art Galleries for the period of the war, and to take exception to paragraph 5 of the third report of the Retrenchment Committee, in which that Committee considers that 'the closing of the Museums and Art Galleries would be a valuable object lesson in economy, and would point the way to similar economies in local Museums and Galleries.' The Conchological Society is of opinion that any financial economy must be far outweighed by the great national loss that would accompany the withdrawal of the facilities given by the public collections to students for research purposes, to the general public (especially at this time to soldiers and sailors, wounded or on leave) as a means of intellectual relaxation and education, and to school children as a valuable means of auxiliary instruction, and respectfully begs the Government to reconsider its decision.

"That a copy of this resolution be forwarded to the Prime Minister and to the Secretary of the Museums Association."

Signed:
ROBERT STANDEN, *President.*
BERNARD LUCAS, *Vice-President.*
LEWIS J. SHACKLEFORD, *Hon. Secretary.*

Exhibits.

By Mrs. Gill: A large series of species of *Eburna*.

By Mr. G. C. Spence: A specimen of *Acroptychia metableta* Crosse and Fischer.

In the Special Exhibit of the genus *Cyclostoma* an interesting series was shown by Mrs. Gill and Mr. G. C. Spence, as well as from the Manchester Museum collection.

450th Meeting, held at the Manchester Museum, March 8th, 1916.

The President in the chair.

Additions to the Library announced and thanks voted :—

"A Review of some Bivalve Shells of the Group *Anatinacea* from the West Coast of America," by William Healey Dall.

"Notes on some Danish Mollusca: *Helix* (*Helicella*) *candicans* Ziegler, and *Helix* (*Theba*) *cartusiana* Müller, in Denmark," by Hans Schlesch *(from the respective authors)*; and the usual periodicals received in exchange.

Donations to the Cabinet announced and thanks voted :—

A large number of specimens for the Voucher Collection acknowledged in detail in the Recorder's periodical reports (per the Hon. Recorder).

Papers Read.

"A Brief Summary of the Genus *Terebra*," by J. C. Melvill, M.A., D.Sc.

"A Revision of the Species of *Terebra* occurring in the Persian Gulf, Gulf of Oman, and Arabian Sea, as evidenced in the Collections formed by Mr. F. W. Townsend, 1893–1914," by J. C. Melvill, M.A., D.Sc., and R. Standen.

Exhibits.

By Mr. G. C. Spence: *Helix lucorum* L. and *H. melanostoma* Drap., from Salonica; *Limicolaria martensiana* Smith, from Tanganyika; and species of the genus *Alcadia*.

By Mr. J. C. Melvill: Species of *Terebra* from the Persian Gulf, to illustrate the above-mentioned papers.

In the Special Exhibit of *Terebra* interesting collections were shown by Messrs. R. Standen, B. R. Lucas, and the Manchester Museum.

It was decided to have the following Special Exhibits at future meetings :—

The Genus *Ancilla* - - - -	April 12th, 1916.
The Section *Pteronotus* of *Murex* -	May 10th, 1916.
The Section *Labyrinthus* of *Helix* -	June 14th, 1916.

451st Meeting, held at the Manchester Museum, April 12th, 1916.

The President in the chair.

Additions to the Library announced and thanks voted:

"The Sub-Antarctic Islands of New Zealand," vols. 1 and 2, edited by Chas. Chilton.

"Index Faunæ Novæ Zealandiæ," by Capt. F. W. Hutton (*received from the Philosophical Institute of Canterbury, New Zealand, per the High Commissioner for New Zealand*); and the usual periodicals received in exchange.

Donations to Collection announced and thanks voted :—

Per the Hon. Recorder.

From Mr. G. Fysher: *Helix nemoralis* from Monasterevan, co. Kildare, and *Clausilia cravenensis* from Barden Tower, York Mid. W.

From Mr. C. Oldham: *Limnæa pereger* from Llangian, Carnarvonshire.

From Mr. C. Upton: *Limnæa truncatula* var. *subangulata* from Lundy Island, Devon N., and *Sphærium pallidum* from Gloucester and Berkeley Canal, Sharpness, Gloucester West; also a number of Voucher specimens.

Candidate Proposed for Membership.

Giuseppe Despott, Valletta University, Malta (introduced by J. R. le B. Tomlin, M.A., and L. J. Shackleford).

Paper Read.

"*Onoba cymatodes*, a new species from the Antarctic," by J. C. Melvill, M.A., D.Sc., and R. Standen.

Exhibits.

By Mr. G. C. Spence: Shell, eggs and embryo of *Obeliscus* (*Eusonyma*) *platyacme* Melv. & Pons., from Pondoland; and a large number of species of *Macroceramus* and *Microceramus*.

By Messrs. J. C. Melvill and R. Standen: Type specimen of a new *Onoba*, to illustrate their paper.

By Mr. C. H. Moore: *Limnæa pereger* var. *lacustris*, *Ancylus fluviatilis*, *Pupa cylindracea*, *Balea perversa* and *Vitrea cellaria* from Keswick.

In the special exhibit of *Ancilla* a fine series was shown from the Manchester Museum Collections, and many of the rarer species were shown by Mr. J. C. Melvill, including one of the finest specimens of *Ancilla cingulata* ever seen, formerly in the Prevost Collection; *A. booleyi* Melv. & Sykes, with operculum; and *A. optima* Sow., one of the finest and rarest species in the genus. Mr. C. H. Moore exhibited fossil *Ancilla* from the Paris Basin.

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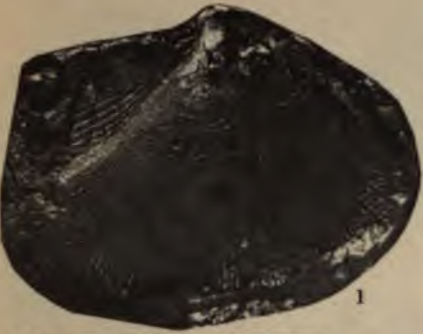
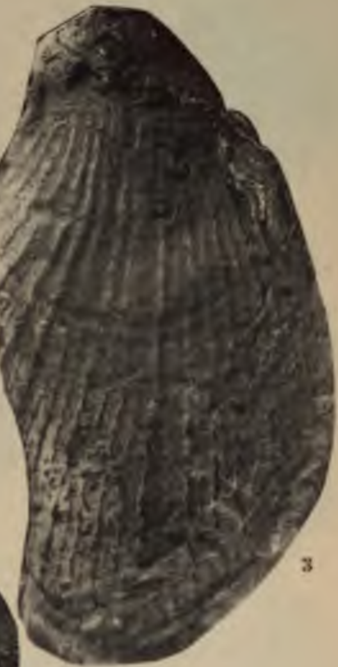
Physa heterostropha Say in Bucks.—With reference to the specimens of *Physa heterostropha* Say, which I found recently at Aylesbury and some of which Mr. J. W. Taylor kindly exhibited on my behalf at the Annual Meeting, it may be of interest to note that these were taken from spots located over a considerable length of the canal there, and not at any particular point or points where warm water or exhaust steam might enter, as is sometimes the case with regard to the habitat of this species. With the exception of one example, which still contained the remains of the dead animal, the shells were young living specimens. As I believe the species has not been taken so far south outside Kew Gardens (even allowing these examples to be identical with the present species), and, in any case, the shell being new to Buckinghamshire, the find is worth recording.—A. E. SALISBURY (*Read before the Society*, Nov. 10, 1915).

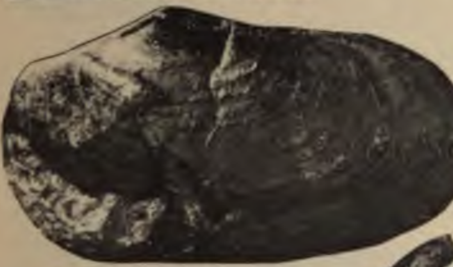
Pisidium lilljeborgi in Nant Ffrancon, Carnarvonshire.—In June, 1915, I visited Llyn y Cwm, a little tarn that lies under the precipitous face of Y Garn at a height of somewhat above 2,000 feet. *P. lilljeborgi* was fairly plentiful in the patches of silt that occur here and there in its stony bed and I took a few specimens of *P. nitidum*, but the only other mollusc I could find was *Ancylus fluviatilis* and that was scarce. I have already recorded the occurrence of *P. lilljeborgi* in Llyn Idwal (*antea*, vol. 13, p. 353), and can now add Llyn Ogwen (1000 feet) where I found it in abundance in one spot. The Idwal and Ogwen shells are similar in appearance, very swollen at the umbones, strongly striated, and glossy. The shells from Llyn y Cwm are larger but less swollen, not so deeply striated, and entirely without gloss. I am once more indebted to Mr. B. B. Woodward for his kindness in identifying the specimens.—CHAS. OLDHAM (*Read before the Society*, Dec. 8th, 1915).

Rossia macrosoma in Carnarvonshire.—On September 11th, 1915, I picked up a living *R. macrosoma* on the beach at Afon Wen. This cephalopod is a deep-water rather than a littoral form but is sometimes stranded after heavy storms. The presence of the animal alive and uninjured, just above the water-line on the shore of this shallow bay, in a dead calm—there had been no wind for some days and the sea was quite smooth—is perhaps worth recording.—CHARLES OLDHAM (*Read before the Society*, February 9th, 1916).

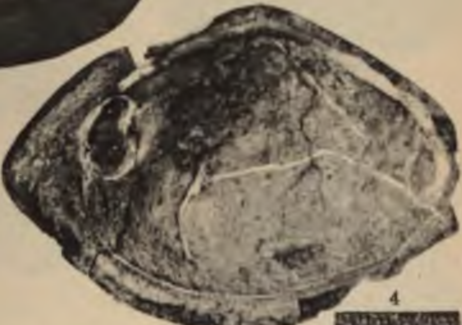

1

2 Mag.


3


9

7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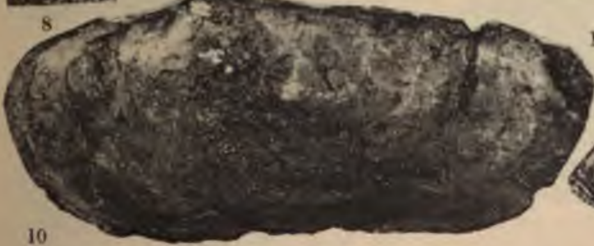
11

Mag. 8

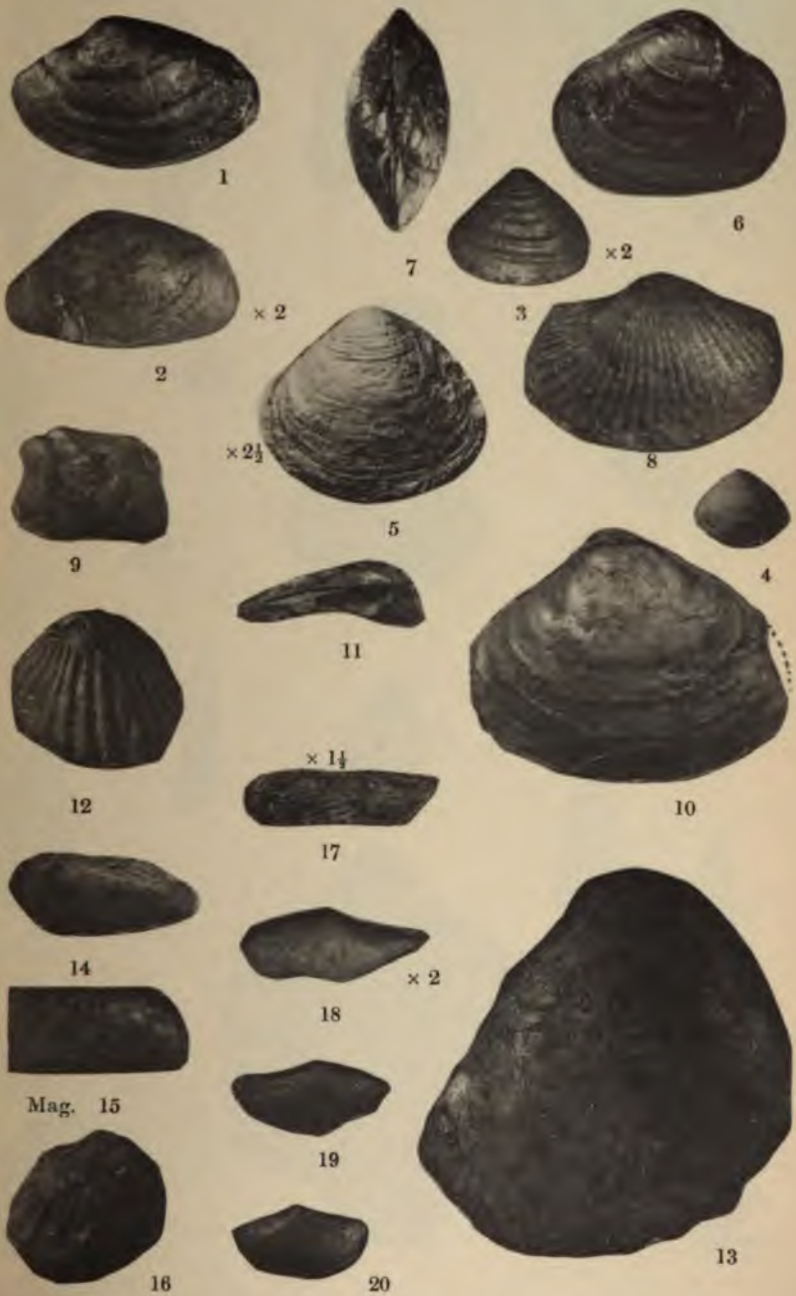
Mag. 6


10

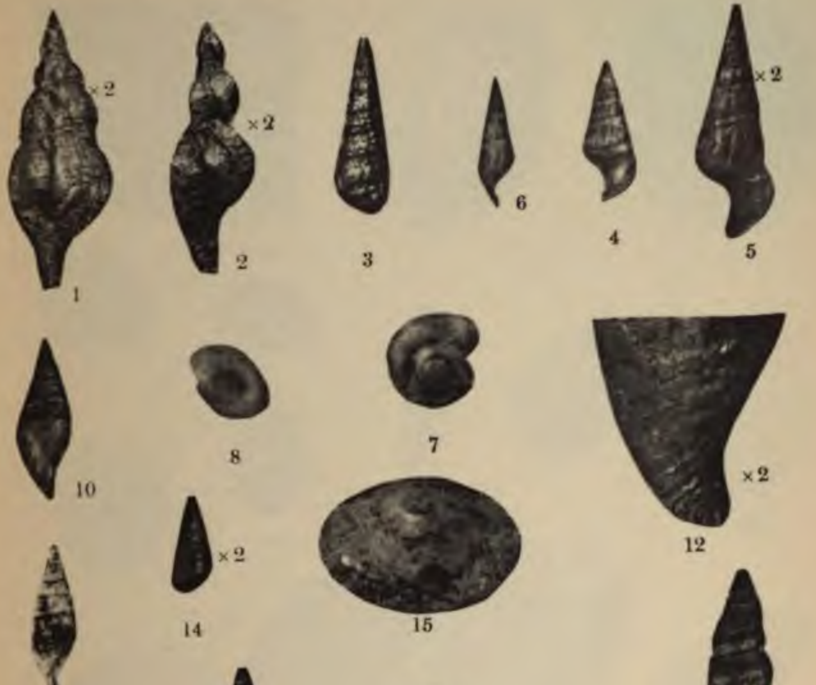
5

EXTINCT PELECYPODA FROM LENHAM SANDSTONE.

(Figures nat. size except when otherwise specified).

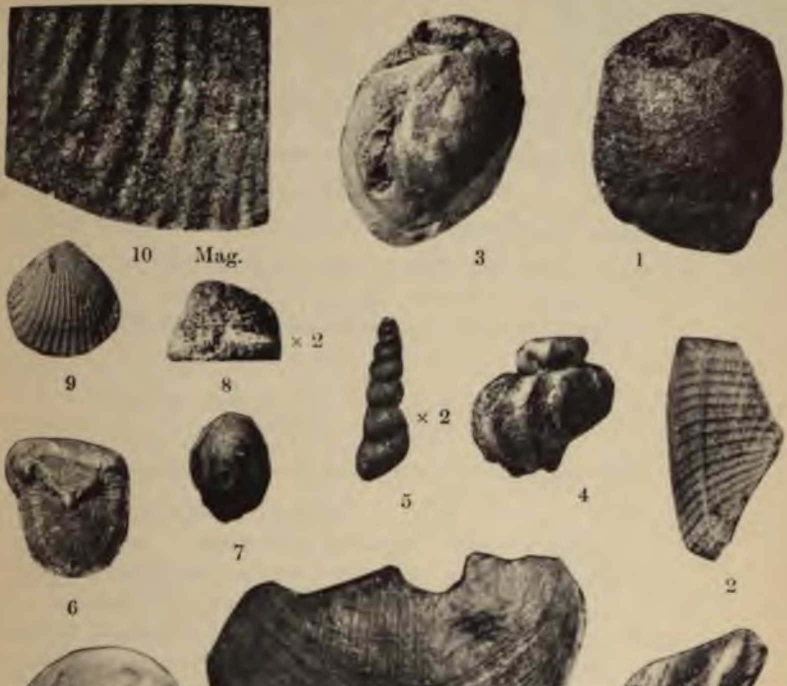


EXTINCT PELECYPODA FROM LENHAM SANDSTONE.
(*Figures nat. size except when otherwise specified*).



EXTINCT GASTROPODA FROM LENHAM SANDSTONE.

(Figures nat. size except when otherwise specified).



EXTINCT BRACHIOPODA AND EXISTING MOLLUSCA *FROM* LENHAM SANDSTONE.

(Figures nat. size except when otherwise specified).

THE

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VOL. 15. OCTOBER, 1916. No. 4.

ON THE CONCHOLOGICAL FEATURES OF THE LENHAM SANDSTONES OF KENT AND THEIR STRATIGRAPHICAL IMPORTANCE.

(Continued from page 84).

BY R. BULLEN NEWTON, F.G.S.,[1]
OF THE BRITISH MUSEUM.

(Presidential Address delivered at the Annual Meeting, October 16th, 1915).

Fam. PTERIIDÆ (=AVICULIDÆ).

MARGARITIFERA PHALÆNACEA Lamarck. [Plate 2, fig. 9].

Avicula phalænacea Lamarck: Hist. Nat. Anim. sans Vert., 1819, vol. 6, part 1, p. 150.

Avicula phalænoides S. V. Wood: Mon. Pal. Soc., 1874, Suppl., pl. 8, fig. 12, and Addend. Plate, fig. 23, pp. 109, 188.

NOTE.—The genus *Margaritifera* of Patrick Browne was founded on the Linnæan type, *Mytilus margaritiferus* (The Civil and Natural History of Jamaica, 1789, p. 412); Lamarck's *Meleagrina* is a synonym.

Distribution—

Coralline Crag	Britain
Plaisancian	France (S.)
Lenham Beds	Britain
Anversian	Belgium
Vindobonian	Vienna Basin; Italy
Burdigalian	France
Aquitanian	Italy.

Collection—

M.P.G., No. 409.

Fam. OSTREIDÆ.

OSTREA PRINCEPS S. V. Wood. [Plate 2, fig. 16].

Ostrea undulata Nyst: Recherch. Coq. Foss. Anvers, 1835, p. 20 (*non* J. Sowerby).

Ostrea princeps S. V. Wood: Mon. Pal. Soc., pl. 1, fig. 1, and pl. 2, fig. 2, p. 17.

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[1] Published by permission of the Trustees of the British Museum.

Distribution—

Red Crag (derivative)	Britain
Scaldisian	Belgium
Coralline Crag	Britain
Lenham Beds	
Diestian	Belgium.

Collection—

M.P.G., No. 402 (associated with *Zaria subangulata*).

Fam. PECTINIDÆ.

PECTEN MAXIMUS (?) Linnæus.

Ostrea maxima Linnæus: Syst. Naturæ, 1758, ed. x., p. 696.

Distribution—

Recent	British and Mediterranean Seas
Red Crag	Britain
Coralline Crag	
Scaldisian	Belgium
Lenham Beds	Britain
St. Erth Beds	
Diestian	Belgium.
Anversian	

Collection—

M.P.G., No. 405 (summit fragment only, showing expansions).

AEQUIPECTEN OPERCULARIS Linnæus.

Ostrea opercularis Linnæus: Syst. Nat., 1758, ed. x., p. 698.

Aequipecten opercularis Sacco: Moll. Terz. Piemonte, 1897, pa 24, pl. 3, figs. 13–35 (with varieties).

Distribution—

Recent	British and Mediterranean Seas
Post-Pliocene	Britain
Norwich Crag	
Red Crag	
Scaldisian	Belgium
Astian	Italy
Plaisancian	
Coralline Crag	Britain
St. Erth Beds	
Box Stones	
Diestian	Belgium
Messinian	Germany (N.).

Collection—

M.P.G., No. 406.

MANUPECTEN PESFELIS Linnæus [Plate 4, figs. 13, 14].

Ostrea pesfelis Linnæus : Syst. Nat., 1758, ed. x., p. 697.

Manupecten pesfelis Sacco : Moll. Terz. Piemonte, 1897, part 24, pl. 12, figs. 1–8 (with varieties), pp. 36, 37.

Distribution—

Recent	Mediterranean
Astian	Italy
Plaisancian	France (S). ; Italy
Redonian	France (N.W.)
Vindobonian	Vienna Basin.

Collection—

M.P.G., No. 407.

CHLAMYS PRINCEPS J. de C. Sowerby [Plate 1, figs 1, 2].

Pecten princeps J. de C. Sowerby : Mineral Conchology, 1826, vol. 6, pl. 542, fig. 2, p. 80.

Distribution—

Scaldisian	Belgium
Norwich Crag. Coralline Crag Lenham Beds	Britain.

Collection—

M.P.G., No. 404.

HINNITES CRISPUS Brocchi.

Ostrea crispa Brocchi : Conch. Foss. Subapennina, 1814, vol. 2, p. 567.

Hinnites crispus Sacco : Moll. Terz. Piemonte, 1897, part 24, pl. 2, figs. 1, 2, p. 10 (=*H. cortesyi* Defrance and *H. dubuissoni* J. de C. Sowerby).

Distribution—

Red Crag (derivative)	Britain
Astian Plaisancian	Italy
Coralline Crag Lenham Beds Box Stones	Britain.
Messinian	France (Bas Dauphiné, recorded by Fontannes).

Collection—

M.P.G., No. 401.

Fam. CARDITIDÆ.

GLANS SENILIS Lamarck [Plate 2, fig. 12].

Venericardia senilis Lamarck : Ann. Mus. Hist. Nat. [Paris], 1806, vol. 7, p. 57.

Distribution—

Red Crag (derivative)	Britain
Scaldisian	Belgium
Coralline Crag Lenham Beds	Britain
Redonian	France (N.W.)
Vindobonian	France (S.).

Collection—

M.P.G., No. 417.

Fam. ASTARTIDÆ.

ASTARTE BASTEROTI La Jonkaire [Plate 2, figs. 4, 5].

Astarte basteroti La Jonkaire : Mém. Soc. Hist. Nat. Paris, 1823 vol. 1, pl. 6, figs. 3, p. 129.

Distribution—

Red Crag	Britain
Scaldisian	Belgium
Coralline Crag Lenham Beds	Britain
Diestian	Belgium
Redonian	France (N.W.)

Collection—

M.P.G., No. 413.

ASTARTE GALEOTTII Nyst [Plate 2, fig. 2].

Astarte galeottii Nyst: Recherch. Coq. Foss. Anvers, 1835 pl. 1, fig. 30, p. 8.

Distribution—

Scaldisian	Belgium
Red Crag (derivative ?) Coralline Crag Lenham Beds	Britain.

Collections—

M.P.G., No. 414.

B.M. (Graham Wallas).

ASTARTE OMALII La Jonkaire [Plate 2, fig. 3].

Astarte omalii La Jonkaire : Mém. Soc. Hist. Nat. Paris, 182 vol. 1, pl. 6, fig. 1, p. 129.

Distribution—

Post-Pliocene Red Crag (derivative ?) Coralline Crag Lenham Beds	Britain

Scaldisian	Belgium
Diestian	
Anversian	
Bolderian	
Redonian	France (N.W.)
Vindobonian	Holland.

Collection—

M.P.G., No. 416.

ASTARTE MUTABILIS S. V. Wood [Plate 2, figs. 6, 7].

Astarte mutabilis S. V. Wood : Mon. Pal. Soc., 1853, pl. 16, figs. 1a, 1b, p. 179 (=*A. planata* Nyst *non* J. Sowerby).

Distribution—

Red Crag	Britain
Coralline Crag	
Scaldisian	Belgium.
Anversian	

Collection—

M.P.G. (not numbered).

Fam. CYPRINIDÆ.

CYPRINA RUSTICA (?) J. Sowerby [Plate 2, fig. 13].

Venus rustica J. Sowerby, Mineral Conchology, 1818, vol. 2, pl. 196, p. 217 [=*C. tumida* Nyst].

The specimen herewith determined consists of a fragmentary sandstone cast, which, when compared with *C. islandica*, exhibits a relatively greater depth of valve, a cordate-globose contour as opposed to a suborbicular form, together with a more prominent lunuloid cavity (=*C. islandica* Reid).

Distribution—

Red Crag (derivative)	Britain
Scaldisian	Belgium
Coralline Crag	Britain
Lenham Beds	
Box Stones	
Diestian	Belgium
Anversian	
Messinian	Germany (N.)
Vindobonian	Denmark.

Collection—

M.P.G., No. 421.

ISOCARDIA HUMANA Linnæus [Plate 4, fig. 12].

Cardium humanum Linnæus : Syst. Nat., 1758, ed. x., p. 682.

Chama cor Linnæus, Syst. Nat., 1767, ed. xii., vol. 1, part 2, p. 1137 (=*I. cor* Reid).

Distribution—

Recent	British and Mediterranean Seas
Red Crag (derivative)	Britain
Coralline Crag	
Lenham Beds	
Diestian	Belgium
Vindobonian	Holland.

Collections—

M.P.G., No. 15878.
B.M. (Prestwich).

Fam. LUCINIDÆ.

DENTILUCINA BOREALIS Linnæus.

Venus borealis Linnæus: Syst. Nat., 1767, ed. xii., vol. 1, part 2, p. 1134.

Dentilucina borealis Sacco: Moll. Terz. Piemonte, 1901, part 29, pl. 18, figs. 23–26, p. 80.

Distribution—

Recent	British and Mediterranean Seas
Post-Pliocene	Britain
Norwich Crag	
Red Crag	
Scaldisian	Belgium
Astian	Italy
Plaisancian	France (S.); Italy
Coralline Crag	Britain
Lenham Beds	
St. Erth Beds	
Diestian	Belgium
Anversian	
Redonian	France (N.W.)
Messinian	Germany (N.)
Vindobonian	Italy; Vienna Basin; Denmark; Holland.

Collection—

M.P.G., No. 412.

Fam. TELLINIDÆ.

ARCOPAGIA VENTRICOSA Serres [Plate 1, figs. 5, 6].

Corbis ventricosa Serres: Géog. Tert. Anim. Invert. Midi France, 1829, pl. 6, fig. 2, p. 146.

Arcopagia corbis Sacco: Moll. Terz. Piemonte, 1901, part 29, pl. 24, figs. 13–15, p. 113.

Distribution—

Astian	Italy
Plaisancian	
Lenham Beds	Britain
Vindobonian	France ; Italy ; Vienna Basin.

Collections—

M.P.G. (not numbered).
B.M. (Graham Wallas).

TELLINA BENEDENI Nyst and Westendorp [Plate 1, fig. 4].

Tellina benedeni Nyst and Westendorp : Bull. Acad. R. Sci. Bruxelles, 1839, vol. 6, part 2, pl. 2, fig. 5^{bis} and pl. 3, fig. 5, p. 399 (=*T. fallax* Beyrich, a manuscript determination).

Distribution—

Red Crag (derivative)	Britain
Scaldisian	Belgium
Lenham Beds	Britain
Diestian	Belgium
Anversian	
Bolderian	
Messinian	Germany (N.)
Vindobonian	Holland ; Denmark.

Collections—

M.P.G., No. 435.
B.M. (Graham Wallas).

MOERA DONACINA Linnæus.

Tellina donacina Linnæus : Syst. Nat., 1758, ed. x., p. 676.

Moerella donacina Sacco : Moll. Terz. Piemonte, 1901, part 29, pl. 22, figs. 24–27, p. 105.

(Fischer's *Moerella* of 1887 is a synonym of *Moera* of Adams, 1856).

Distribution—

Recent	British and Mediterranean Seas
Post-Pliocene	Britain
Red Crag (derivative)	
Scaldisian	Belgium
Astian	Italy
Plaisancian	
Coralline Crag	Britain
Lenham Beds	
Vindobonian	Italy ; Vienna Basin ; Holland.

Collection—

M.P.G., No. 436.

GASTRANA LAMINOSA J. de C. Sowerby [Plate 2, figs. 14, 15].

Petricola laminosa J. de C. Sowerby: Mineral Conchology, 1827, vol. 6, pl. 573, p. 142.

Gastrana laminosa S. V. Wood: Mon. Pal. Soc., 1857, pl. 25, fig. 1, p. 217.

Distribution—

Scaldisian	Belgium
Red Crag Coralline Crag Lenham Beds	Britain.

Collection—

M.P.G., No. 428 (associated in sandstone block with *Panopæa menardi*).

Fam. MACTRIDÆ.

SPISULA ARCUATA J. Sowerby [Pl. 2, figs. 10, 11].

Mactra arcuata J. Sowerby: Mineral Conchology, 1817, vol. 2, pl. 160, figs. 1, 6, p. 135.

Post-Pliocene Norwich Crag Red Crag	Britain
Scaldisian	Belgium
Lenham Beds	Britain
Diestian Bolderian	Belgium.

Collections—

M.P.G., No. 429; C.R., 1257 to C.R., 1260.

B.M. (Graham Wallas).

SPISULA SUBTRUNCATA DaCosta.

Trigonella subtruncata DaCosta: British Conchology, 1778, p. 198.

Spisula subtruncata Sacco: Moll. Terz. Piemonte, 1901, part 29, pl. 6, figs. 3–8, pp. 25, 26 (including varieties).

Distribution—

Recent	British and Mediterranean Seas
Post-Pliocene Norwich Crag Red Crag	Britain.
Scaldisian	Belgium
Astian	Italy
Plaisancian	France (S.); Italy

Coralline Crag	Britain
St. Erth Beds	
Lenham Beds	
Box Stones	
Redonian	France (N.W.)
Vindobonian	Italy; Vienna Basin.

Collections—

M.P.G., No. 427.
B.M. (Prestwich and Graham Wallas).

Fam. VENERIDÆ.

PITAR RUDIS Poli.

Venus rudis Poli: Test. Siciliæ, 1795, vol. 2, pl. 20, figs. 15, 16, p. 94.

Pitar rudis Sacco: Moll. Terz. Piemonte, 1900, part 28, pl. 4, figs. 22–25, p. 19.

Distribution—

Recent	Mediterranean; Black Sea, etc.
Post-Pliocene	Britain
Red Crag	
Scaldisian	Belgium
Astian	Italy
Plaisancian	France (S.); Italy
Coralline Crag	Britain
Lenham Beds	
Redonian	France (N.W.)
Vindobonian	Italy; Holland.

llections—

M.P.G., Nos. 423, 424.
B.M. (Prestwich and Graham Wallas).

ALLISTA CHIONE Linnæus.

Venus chione Linnæus: Syst. Nat., 1758, ed. x., p. 686.

Callista chione Sacco: Moll. Terz. Piemonte, 1900, part 28, pl. 2, figs. 3–6, p. 12.

tribution—

Recent	British and Mediterranean Seas
Red Crag (derivative)	Britain
Scaldisian	Belgium
Astian	Italy
Plaisancian	France (S.); Italy
Coralline Crag	Britain
Lenham Beds	

Diestian Anversian Bolderian	Belgium
Redonian	France N.W.
Vindobonian	Italy ; Poland, etc.

Collections—

M.P.G., No. 422.

B.M. (Graham Wallas).

TAPES PEROVALIS S. V. Wood [Plate 2, fig. 1].

Tapes perovalis S. V. Wood: Mon. Pal. Soc., 1853, pl. 19, f. 7, p. 203.

Distribution—

Coralline Crag Lenham Beds	Britain.

Collection—

M.P.G. (not numbered).

Fam. CARDIIDÆ.

PAPILLICARDIUM PAPILLOSUM Poli [Plate 4, figs. 9, 10].

Cardium papillosum Poli: Testacea utriusque Siciliæ, 1791, vol. 1, part 2, pl. 16, figs. 2–4, p. 56.

Papillicardium papillosum Sacco: Moll. Terz. Piemonte, 1899, part 27, pl. xi., figs. 1–3, p. 44.

Distribution—

Recent	Mediterranean Sea
Astian	Italy; France (S.)
Plaisancian	Germany (near Cassel)
St. Erth Beds Lenham Beds	Britain
Redonian	France (N.W.)
Messinian	Germany (N.)
Vindobonian	Italy ; France.

Collections—

M.P.G., No. 419.

B.M. (Prestwich ; Graham Wallas).

PLAGIOCARDIUM HIRSUTUM Bronn [Plate 1, figs. 7, 8].

Cardium hirsutum Bronn: Italiens Tertiär-Gebilde, 1831, p. 104.

Plagiocardium hirsutum Sacco: Moll. Terz. Piemonte, 1899, part 27, pl. xi., figs. 11–14, p. 46 (=*Cardium* n.sp., Reid).

Distribution—

Astian Plaisancian	Italy
Lenham Beds	Britain
Vindobonian	Italy ; Vienna Basin.

Collections—

M.P.G., No. 420.
B.M. (Graham Wallas).

Fam. SOLENIDÆ.

Ensis ensis Linnæus.

Solen ensis Linnæus: Syst. Nat., 1758, ed. x., p. 672.

Ensis ensis Sacco: Moll. Terz. Piemonte, 1901, part 29, pl. 4, figs. 21, 22, p. 18.

Distribution—

Recent	British and Mediterranean Seas; Atlantic
Post-Pliocene	Ireland
Red Crag	Britain
Scaldisian	Belgium
Astian	Italy
Plaisancian	
Coralline Crag	Britain
St. Erth Beds	
Lenham Beds	
Diestian	Belgium
Anversian	
Redonian	France (N.W.)
Vindobonian	Vienna Basin.

Collections—

M.P.G., No. 433.
B.M. (Graham Wallas).

Fam. SAXICAVIDÆ.

Cyrtodaria angusta Nyst and Westendorp [Plate 1, fig. 10].

Glycimeris angusta Nyst and Westendorp: Bull. Acad. R. Sci., Bruxelles, 1839, vol. 6, part 2, pl. 1, fig. 1, p. 396.

Cyrtodaria angusta Fischer: Man. Conchyliologie, 1887, p. 1128.

Distribution—

Red Crag (derivative?)	Britain
Scaldisian	Belgium
Coralline Crag	Britain
Lenham Beds	
Box Stones	
Diestian	Belgium
Anversian	
Bolderian	
Messinian	Germany (N.).

Collection—

B.M., No. L. 24065.

PANOPÆA MENARDI Deshayes [Plate 1, fig. 9].

Panopæa menardi Deshayes: Dict. Class. Hist. Nat., 1828, vol. 13, p. 22 (not figured).

Panopæa faujasii Du Bois Montpéreux: Conch. Foss. Wolhyni-Podolien, 1831, pl. 4, figs. 1–4, p. 51, *non* Ménard de la Groye.

Panopæa gentilis J. de C. Sowerby: Mineral Conchology, 1840, vol. 7, pl. 610, fig. 1, p. 1.

Distribution—

Red Crag	Britain
Coralline Crag	
Lenham Beds	
Box Stones	
Anversian	Belgium
Messinian	Germany (N.)
Vindobonian	France (S.W.); Poland; Italy; Vienna Basin; Holland.

Collections—

M.P.G., No. 428.

B.M. (Graham Wallas).

Fam. PHOLADIDÆ.

BARNEA CYLINDRICA J. Sowerby [Plate 2, fig. 17].

Pholas cylindricus J. Sowerby: Mineral Conchology, 1818, vol. 2, pl. 198, p. 223.

Distribution—

Red Crag	Britain
Lenham Beds	

Collection—

M.P.G., No. C.R., 1274.

ASPIDOPHOLAS RUGOSA Brocchi [Plate 1, fig. 11].

Pholas rugosa Brocchi: Conch. Foss. Subapennina, 1814, vol. 2, pl. xi., fig. 12, p. 591.

Aspidopholas rugosa Sacco: Moll. Terz. Piemonte, 1901, part 29, pl. 13, figs. 56–60, p. 56.

Distribution—

Astian	Italy
Plaisancian	
Lenham Beds	Britain

Collection—

M.P.G. (not numbered).

PHOLADIDEA PAPYRACEA Turton.

Pholas papyracea and *lamellata* Turton : Conchylia Insularum Britannicarum, 1822, pl. 1, figs. 1–6, pp. 2, 3.

Pholadidea papyracea Forbes and Hanley: Hist. Brit. Moll., 1848, vol. 1, p. 123, pl. 5, figs. 3–6, pl. 2, fig. 1.

Distribution—

Recent	British Seas
Coralline Crag	Britain
Lenham Beds	
Diestian	Belgium
Anversian	
Redonian	France (N.W.).

Collection—

M.P.G., No. 432.

Fam. TEREDINIDÆ.

(?) TEREDO sp. indeterminable.

Collection—

M.P.G., No. 437.

Fam. ANATINIDÆ.

THRACIA CONVEXA W. Wood.

Mya convexa W. Wood : General Conchology, 1815, vol. 1, pl. 18, fig. 1, p. 92.

Thracia pubescens (*non* Pulteney) and *ventricosa* Philippi : Enum. Moll. Siciliæ, 1836 and 1844, vol. 1, pl. 1, fig. 10, p. 19, vol. 2, p. 17 (= *T. ventricosa* Reid).

Distribution—

Recent	British Seas
Post-Pliocene	Ireland
Astian	Italy
Plaisancian	
Coralline Crag	Britain
Lenham Beds	
Box Stones	
Vindobonian	Italy; Vienna Basin; Denmark.

Collections—

M.P.G., No. 439.

B.M. (Graham Wallas).

THRACIA PUBESCENS Pulteney.

Mya pubescens and *declivis* Pulteney : Cat. Shells Dorsetshire Coast, new edition Hutchins' "History of Dorset," 1799, pl. 4, fig. 6, pp. 27, 28, 109.

Thracia pubescens Sacco: Moll. Terz. Piemonte, 1901, part 29, pl. 27, figs. 7–9, p. 134.

Thracia ventricosa S. V. Wood: Mon. Pal. Soc., Second Suppl., 1859, pl. 5, fig. 3, p. 48, *non* Philippi.

Distribution—

Recent	British and Mediterranean Seas
Post-Pliocene	Britain
Scaldisian	Belgium
Astian	Italy
Plaisancian	
Coralline Crag	Britain
Lenham Beds	
Vindobonian	Italy

Collections—

M.P.G., Nos. 1271–1273, 438, 15880, 422 (with *Callista chione*).
B.M. (Graham Wallas).

Brachiopoda.

Fam. TEREBRATULIDÆ.

TEREBRATULA PERFORATA (Defrance), Desnoyers [Pl. 4, figs. 15–17].

Terebratula perforata Desnoyers: Mém. Soc. Hist. Nat. Paris, 1825, vol. 2, part 1, p. 239; name founded on S. Dale's figures in "The History and Antiquities of Harwich and Dovercourt," ed. 2, 1732, pl. xi., fig. 9, p. 294 = *T. spondylodes* W. Smith, 1817, insufficiently defined and not figured; *T. variabilis* J. de C. Sowerby, 1827; *T. maxima* Charlesworth, 1837; *T. sowerbyana* Nyst, 1845; *T. grandis* Davidson, 1852, *non* Blumenbach, 1803; *T. perforata* Dautzenberg and Dollfus: Ann. Soc. R. Mal. Belgique, 1896, vol. 31, Proc. Verb., pp. xvii.–xix. (= *T. grandis* Reid).

Distribution—

Red Crag	Britain
Coralline Crag	
Lenham Beds	
Scaldisian	Belgium
Diestian	
Anversian	
Bolderian	
Redonian (=Tortonian)	France (N.W.).

Collections—

M.P.G., No. 400.
B.M. (Prestwich, No. B. 11158; Graham Wallas).

DISTRIBUTION TABLE OF THE LENHAM MOLLUSCA AND BRACHIOPODA.

GENERA AND SPECIES.	GEOLOGICAL HORIZONS.																		
	Aquitanian	Burdigalian	Vindobonian	Redonian	Messinian	Box-Stones	Lenham Beds	St. Erth Beds	Coralline Crag	Bolderian	Anversian	Diestian	Scaldisian	Plaisancian	Astian	Red Crag	Norwich Crag	Post-Pliocene	Recent
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Gastropoda—																			
Capiluna græca Linnæus, sp.			x	x			x		x				x			x			x
Emarginula fissura Linn., sp.				x			x		x		x		x	x	x	x			x
Eumargarita trochoidea S. V. Wood, sp.							x						x			x		x	x
Calliostoma zizyphinum L., sp.						x	x	x	x			x	x			x			x
Ampullotrochus miliaris Brocchi, sp.			x		x		x	x	x		x			x	x				x
Capulus ungaricus Linn., sp.			x	x			x	x	x			x	x			x		x	x
Trivia europæa Montagu, sp.			x	x			x	x	x		x	x	x	x	x	x		x	x
Ptychopotamides tricinctus Brocchi, sp.			x	x			x	x					x	x	x	x	x	x	
Scala subulata J. de C. Sow., sp.							x		x			x	x			x			(?)
Hyaloscala clathratula Kanmacher, sp.				x			x		x			x	x						x
Pyramidella plicosa Bronn, sp.			x		x		x		x		x			x	x	x			
Subularia subulata Don., sp.			x		x		x	x	x		x	x	x	x	x				x
Zaria subangulata Brocchi, sp.			x		x		x	x	x		x			x	x				
Xenophora crispa (?) König, sp.							x							x	x				
Aporrhais pespelecani L., sp.			x				x		x		x	x	x	x	x	x	x	x	x
Semicassis saburon Brug., sp.			x		x	x	x				x		x	x	x	x			x
Pyrula reticulata Lamarck ...			x	x	x	x	x		x	x	x	x		x	x	x			x
Streptochetus sexcostatus Beyrich, sp.			x		x		x				x								
Tritia limata Chemnitz, sp. ...		x	x	x	x		x		x		x		x	x	x				x
Murex badensis Nyst			x				x		x				x			x			
Boreotrophon clathratum L., sp.							x		x	x						x	x	x	x
Trophonopsis muricatus Montagu, sp.				x			x						x			x		x	x
Bonellitia serrata Bronn, sp.			x				x							x					
Maculopeplum lamberti J. Sowerby, sp.			x	x		x	x		x			x	x			x			
Turris turrifera Nyst, sp.			x		x		x			x	x	x	x	x	x	x		x	
Drillia obeliscus Des Moul., sp.		x	x		x		x			x	x	x							
Clavatula jouanneti DesM., sp.		x	x				x												
Terebra acuminata Borson ...			x		x		x				x			x	x				
Actæon tornatilis Linnæus, sp.			x		x		x		x		x	x	x	x	x	x	x		x
Ringiculella lenhamensis sp. n.							x												
Scaphander lignarius L., sp.			x	x	x		x		x	x	x	x	x	x	x	x			x
Bullinella cylindracea Pennant, sp.			x	x	x		x		x		x	x	x	x	x	x			x
Scaphopoda—																			
Dentalium entale Linnæus ...			x		x	x	x				x	x	x	x			x	x	x
Pelecypoda—																			
Nucula proxima Say							x	x	x		x							x	x
Nucula cf. *sulcata* Bronn ...			x				x	x						x	x				x
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

DISTRIBUTION TABLE (*continued*).

GENERA AND SPECIES.	GEOLOGICAL HORIZONS.																		
	Aquitanian 1	Burdigalian 2	Vindobonian 3	Redonian 4	Messinian 5	Box-Stones 6	Lenham Beds 7	St. Erth Beds 8	Coralline Crag 9	Bolderian 10	Anversian 11	Diestian 12	Scaldisian 13	Plaisancian 14	Astian 15	Red Crag 16	Norwich Crag 17	Post-Pliocene 18	Recent 19
Pelecypoda (*contd.*).—																			
Yoldia oblongoides S.V.Wd., sp.							x									x	x	x	
Monia patelliformis Linn., sp.							x		x					x	x	x	x	x	x
Anadara diluvii Lamarck, sp.			x		x		x			x	x			x					
Fossularca lactea Linnæus, sp.			x	x			x		x					x	x	x		x	x
Glycymeris pilosa Linnæus, sp.			x	x	x	x	x	x	x		x	x	x		x				x
Mytilus edulis Linnæus var. *ungulatus* Poli							x									x			x
Volsella barbata Linnæus, sp.							x							x		x			x
Margaritifera phalænacea Lamarck, sp.	x	x	x				x		x		x			x					
Ostrea princeps S. V. Wood							x		x			x	x			x			
Pecten maximus (?) Linn., sp.							x	x	x		x	(?)	x			x			x
Æquipecten opercularis L., sp.					x	x	x	x	x			x	x	x	x	x	x	x	x
Manupecten pesfelis Linn., sp.			x	x			x							x	x				x
Chlamys princeps J.deC.S., sp.							x		x				x				x		
Hinnites crispus Brocchi, sp.					x	x	x		x					x	x	x			
Glans senilis Lamarck, sp. ...			x	x			x		x				x			x			
Astarte basteroti La Jonkaire				x			x		x			x	x			x			
Astarte galeottii Nyst							x		x				x			x			
Astarte omalii La Jonkaire ...			x	x			x		x	x	x	x	x			x		x	
Astarte mutabilis S. V. Wood							x		x		x		x			x			
Cyprina rustica (?) J.Sow., sp.			x		x	x	x		x		x	x	x			x			
Isocardia humana (=*cor*) Linnæus, sp.			x				x		x			x				x			x
Dentilucina borealis Linn., sp.			x	x	x		x	x	x		x	x	x	x	x	x	x	x	x
Arcopagia ventricosa Serres, sp.			x				x							x	x				
Tellina benedeni Nyst & West.			x		x		x			x	x	x	x			x			
Moera donacina Linnæus, sp.			x				x		x				x	x	x	x		x	x
Gastrana laminosa J.deC.S., sp							x		x				x			x			
Spisula arcuata J. Sow., sp.							x			x		x	x			x	x	x	
Spisula subtruncata DaC., sp.			x	x		x	x	x	x				x	x	x	x	x	x	x
Pitar rudis Poli, sp.			x	x			x		x				x	x	x	x		x	x
Callista chione Linnæus, sp. ...			x	x			x		x	x	x	x	x	x	x	x			x
Tapes perovalis S. V. Wood ...							x		x										
Papillicardium papillosum Poli, sp.			x	x	x		x	x						x	x				x
Plagiocardium hirsutum Brn.			x				x							x	x				
Ensis ensis Linnæus, sp. ...			x	x			x	x	x		x	x	x	x	x	x		x	x
Cyrtodaria angusta N.&W., sp.					x	x	x		x	x	x	x	x			x			
Panopæa menardi Deshayes ...			x		x	x	x		x		x					x			
Barnea cylindrica J. Sow., sp.							x									x			
Aspidopholas rugosa Brocchi, sp							x							x	x				
Pholadidea papyracea Turt., sp.				x			x		x		x	x							x
Thracia convexa W. Wood ...			x			x	x		x					x	x			x	x
Thracia pubescens Pulteney, sp.			x				x		x				x	x	x			x	x
Brachiopoda—																			
Terebratula perforata Desnoy.				x			x		x	x	x	x	x			x			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

CONCLUSIONS.

We gather from the previous literature on this subject that the majority of investigators have agreed that the Lenham Beds are equivalent to the Diestian deposits of Belgium, which have been generally recognised by geologists as belonging to the base of the Pliocene system, on account of the shell remains exhibiting a marked Miocene facies with many species identical or related to southern or Mediterranean forms. The Miocene aspect of the Lenham fauna is very pronounced, as out of the seventy-seven conchological species that have been determined in the present work, forty-seven, or sixty per cent. date their origin from the Vindobonian (Helvetian-Tortonian) stage, which represents the middle part of that epoch in such countries as Germany, Italy, France (S.), Holland, Denmark, and Austria (Vienna Basin). Again, twenty-six of the Lenham species occur as well in the Redonian beds of Gourbesville, Normandy, which are either of Vindobonian or Messinian age and therefore Miocene. These Gourbesville deposits are of peculiar interest. They were originally discovered by Vasseur,[1] and ascribed to Pliocene or Red Crag times, having been more critically studied since by M. G. F. Dollfus,[2] who in 1880 regarded them as of similar age, although subsequently determining them as belonging to his[3] "Étage, Rédonien," which in explanation was stated to be neither Helvetian nor Plaisancian, but equivalent in time to the Tortonian stage of the Miocene, notwithstanding that he had previously paralleled this new horizon with the Anversian Beds of Belgium.[4] The Redonian fauna was considered to be related to the Gedgravian (Coralline Crag) of England.

About twenty of the Lenham shells, including *Anadara diluvii*, occur in the Upper and Middle Miocene of Holland, and a rather smaller number of species in the same horizons of Denmark, as determined by Molengraaff and Van Waterschoot Van der Gracht[5] for Holland and by Ravn[6] for Denmark. The Pelecypod, *Anadara diluvii*, is of frequent occurrence in the Lenham Beds, and although unknown in the Diestian of Belgium, it is found in the Bolderian (=Tortonian) and Anversian (=Messinian) of that country, as well as in the Vindobonian of Germany, France, Austria, and Italy, and in the Plaisancian deposits of Italy and France; its only British occurrence from the Lenham sandstones was first recorded by Mr.

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[1] Bull. Soc. Géol. France, 1879, ser. 3, vol. 7, p. 741.

[2] Bull. Soc. Géol. Normandie, 1880.

[3] Assoc. Française-Cherbourg, 1905, published 1906, pp. 358-370.

[4] Bull. Soc. Géol. France, 1903, ser. 4, vol. 3, p. 258.

[5] Niederlande: Handb. Region. Geologie, 1913, vol. 1, part 3, p. 53.

[6] Molluskfaunaen I Jyllands Tertiaeraflejringer, etc., *Mus. Min. Géol. Universit. Copenhague: Paléontologiques*, No. 7, 1907 (plates and text).

Reid. The Lenham fauna presents an interesting resemblance to that of the Upper Miocene of North Germany (Reinbeck and Holstein), described by Zimmermann[1] and Gottsche,[2] and regarded as Messinian or the latest stage of the Miocene period, a formation-term introduced by Mayer-Eymar,[3] to include Pontian-Sarmatian, Zanclean, and Miocene of other authors. The North German Miocene deposits contain twenty-five species of mollusca which are also found in the Lenham beds, among them being *Streptochetus sexcostatus*, *Zaria subangulata*, *Tellina benedeni*, *Papillicardium papillosum*, etc.

Speaking further of this Miocene facies of the fauna, it may be observed that *Drillia obeliscus* and *Clavatula jouanneti* are first known in Burdigalian times, whereas *Margaritifera phalænacea* commenced its career in the Aquitanian stage, which forms the basal or oldest division of the Miocene formation. The following Gastropods may also be referred to as dating from the Vindobonian stage of the Miocene: *Streptochetus sexcostatus*, also Messinian and Anversian; *Bonellitia serrata*, ranging into the Italian Plaisancian; *Terebra acuminata*, occurring also in the Messinian of North Germany, the Anversian of Belgium, and in the Plaisancian and Astian beds of Italy; *Maculopeplum lamberti*, recorded as well from the Redonian of France, the Diestian and Scaldisian of Belgium, the Box-Stones and the Coralline and Red Crags of England; and *Ficus reticulata* known also from the Redonian of France, the Messinian of North Germany, the Bolderian, Anversian, and Diestian of Belgium, Box-Stones, Lenham Beds, and Coralline Crag of Britain, Plaisancian and Astian of France and Italy, and belonging also to recent seas. Among the chief Pelecypods similarly originating in Vindobonian times are: *Glans senilis*, known also in the Redonian, Scaldisian, and Coralline Crag; *Arcopagia ventricosa*, also Plaisancian and Astian; *Tellina benedeni*, Messinian and from Bolderian to Scaldisian; *Plagiocardium hirsutum*, Plaisancian and Astian; *Astarte basteroti*, Redonian, Diestian, and Scaldisian; *Papillicardium papillosum*, Messinian, Redonian, St. Erth Beds, Plaisancian and Astian to recent seas; *Cyprina rustica*, Messinian, Anversian to Scaldisian, Box-Stones, and Coralline Crag; *Cyrtodaria angusta*, Messinian, Bolderian to Scaldisian, Box-Stones, and Coralline Crag; and *Panopæa menardi*, Anversian, Messinian, Box-Stones, Coralline and Red Crags.

The only representative of the Brachiopod group of shells is *Terebratula perforata*, which ranges through the Redonian of France,

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[1] Ueber der Schichten der Tertiärformation welche bei Reinbeck durch die Hamburg, etc.: *Amtl. Ber. Deutsch. Nat. Aerz. Kiel* (1846), 1847, pp. 232-234.

[2] Die Mollusken-Fauna des Holsteiner Gesteins: *Abhandl. Geb. Nat. Ver. Hamburg*, 1887, vol. x., no. 8, pp. 14.

[3] Cat. Syst. Foss. Tert. Mus. Zurich, 1867, part 2, p. 13.

Bolderian to Scaldisian of Belgium, and the Coralline and Red Crags of Britain. With the exception of *Ficus reticulata* and *Papillicardium papillosum*, which exist in present seas, the species thus enumerated are extinct. Several of the Lenham species occur in the Bolderian and Anversian beds of Belgium, the latter according to M. Dollfus[1] being Vindobonian, and equivalent to his Redonian stage, although attributed by Renevier[2] to the later Pontian (=Messinian) division of the Miocene. The Anversian and Diestian occurrences represent 34 and 30 species respectively, Box-Stones 12, St. Erth 15, and the Coralline Crag 50. It has been urged by Mr. Harmer that the Coralline Crag fauna is younger than that occurring in the Lenham deposits because several of the older shells found there and that have been previously alluded to are absent in the Coralline Crag beds, a fact more or less accurate, although some important forms do occur in those deposits, such, for instance, as *Margaritifera phalænacea*, *Glans senilis*, *Cyrtodaria angusta*, *Panopæa menardi*, *Terebratula perforata*, etc.

All these facts seem to suggest that the Lenham and Coralline Crag faunas, although showing certain differences of detail, are, nevertheless, to be regarded as presenting a close relationship, and therefore to be considered as of approximately the same age. Marked affinities are also noticeable in the molluscan faunas of the Coralline Crag and the Diestian beds of Belgium. This is apparent from Mr. Harmer's list of the Diestian species (*Quart. Journ. Geol. Soc.*, 1898, vol. 54, p. 317), in which, out of rather more than seventy forms enumerated, nearly all are stated to occur in the Coralline Crag.

A considerable proportion of the Anversian species of Belgium, as listed by M. Van den Broeck (Ann. Soc. Mal. Belgique, 1874, vol. 9, pp. 118–121), likewise occur in the Coralline Crag, as out of a list of 175 species 80 are recognised as being found in that formation.

The following table shows the numerical representation of the seventy-seven Lenham species occurring in the principal formations:

Recent - - - -	40 species
Post-Pliocene - - -	23 ,,
Astian - - - -	36 ,,
Plaisancian - - -	40 ,,
Scaldisian - - -	44 ,,
Norwich Crag - - -	12 ,,
Red Crag - - -	48 ,,

(probably derived from Coralline Crag).

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[1] *Bull. Soc. Géol. France*, 1903, ser. 4, vol. 3, pp. 256-260.

[2] Chronographie Géol.—Text Explicatif; *Comp. Rend. Cong. Géol. Internat.* (1894), 1897, p. 597.

Coralline Crag	51	species
St. Erth	16	„
Box-Stones	13	„
Diestian	30	„
Anversian	34	„
Messinian	25	„
Bolderian	17	„
Redonian (Tortonian)	26	„
Vindobonian (Helvetian–Tortonian)	47	„

The so-called Older Pliocene beds of Mr. Reid's Memoir are characterised by shells with a southern facies indicating warmer climatic conditions than prevailed in the Red Crag period, when boreal and Arctic species were largely predominant. The East Anglian Box-Stone deposits have been regarded by Mr. Harmer[1] as the probable equivalent in time of the Waenrode Beds of Belgium which Van den Broeck[2] has considered to be of Bolderian age and therefore Miocene. In this connection it is interesting to note that the Box-Stone beds have been quite recently regarded as Miocene by Mr. Reid.[3]

Sir Ray Lankester[4] determined some Proboscidean remains from those beds as a new species of *Mastodon*, although subsequently recognising them as a variety of *M. angustidens* of Cuvier,[5] being further of opinion that they were of older age than the Diestian of Belgium. It is well known that Cuvier's species characterises the older Vindobonian beds of France, and is frequently found in the ossiferous deposits of Sansan. When the Box-Stone mollusca are more studied, such an age as is here indicated will probably be more conclusively proved; in the meantime the evidence is in favour of those deposits being older than the Lenham Sandstones. The St. Erth deposits of Cornwall were originally described by Searles Wood[6] as of Red Crag age, although he observed that "the character of the mollusca, as a whole, is essentially southern, no peculiarly Arctic shell having as yet occurred."

The fauna was more particularly described by Prof. Kendall and R. G. Bell[7] in the following year and again referred to as contemporary with that of the Red Crag, a result contrary to the views of Mr. Reid who claimed a greater age. Since that discussion Mr. Alfred Bell[8] has published a paper on the St. Erth mollusca and regarded their age as Mio-Pliocene or Messinian, a somewhat similar horizon having already been partially suggested by Gwyn Jeffreys,[1] who stated: "He was not clear whether the St. Erth deposit was of Older Pliocene or possibly of Upper Miocene age." In the same paper Mr. A. Bell placed upon record an important opinion he had received from M. Dollfus, which reads as follows:—"You have in St. Erth exactly the same Pliocene fauna as we have at Gourbesville in the Contentin," a statement more or less confirming the previous researches of Mr. Reid (1890), who had acknowledged the necessity of a strict comparison between the molluscan species of Gourbesville and those of the St. Erth deposits, as the fossils from the former locality "point to conditions very similar to those indicated by the shells from St. Erth." The Gourbesville fauna, however, as previously mentioned, is now considered to be of Miocene age (Tortonian or Messinian). About fifty per cent. of the Lenham shells are extinct species, a somewhat similar per-centage marks the Box-Stone fauna (according to a calculation made from Mr. A. Bell's memoir in *Journ. Ipswich Field Club*, 1911, vol. 3, pp. 7, 8) and Mr. Reid (Survey Memoir, 1900, p. 64) has stated that the Coralline Crag and St. Erth deposits contain each about forty per cent. of extinct shells. It will be observed that there is a similarity running through these per-centages of extinct forms, which appears to furnish satisfactory evidence for regarding the four stages of Mr. Reid's "Older Pliocene" group as of the same approximate geological age, although the Box-Stones, as before explained, may be somewhat older.

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[1] *Quart. Journ. Geol. Soc.*, 1900, vol. 56, p. 708.

[2] *Ann. Soc. R. Mal. Belgique*, 1884, vol. 19, pp. lvi.-lxvi.

[3] *Mededeel. Rijks. Delfst.*, 1915, no. 6, p. 9.

[4] *Quart. Journ. Geol. Soc.*, 1870, vol. 26, pp. 507-509.

[5] *Geol Mag*, 1890, p 292.

[6] *Quart. Journ. Geol. Soc.*, 1885, vol. 41, pp. 65-73.

[7] *Quart. Journ. Geol. Soc.*, 1886, vol. 42, pp. 201-214.

[8] *Trans. R. Geol. Soc. Cornwall*, 1898, vol. 12, p. 133.

From the foregoing details of the different faunas involved in this discussion, it is certain that many of the species had their origin in Miocene times. There is good reason for recognising the St. Erth shells as of Miocene age, because of their relationship to species characterising the French Redonian. Similarly, the Box-Stone fossils would belong to the same period, as their affinities are with those of the Bolderian of Belgium, which is generally regarded as Tortonian or Upper Vindobonian.

Lastly, the Lenham fauna with its strong Vindobonian and Coralline Crag facies should also be placed in the Miocene, and in consideration of its relationship to that characterising the Upper Miocene deposits of Northern Germany and the Anversian beds of Belgium, I would recognise it as belonging to the latest or Messinian stage of the Miocene, which is synonymous with the term Mio-Pliocene. The stratigraphical name of Mio-Pliocene was introduced into Belgian geology by Mourlon,[2] who regarded it as including Lyell's "Upper

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[1] *Quart. Journ. Geol. Soc.*, 1885, vol. 41, p. 72.

Géologie de la Belgique, 1880, vol. 1, p. 261.

Miocene" and Dumont's "Pliocène Diestien." It was recognised as comprising two divisions or zones, the first characterised by *Panopæa menardi*, and the second by *Glycymeris* [*Pectunculus*] *pilosa*, both of which are now included in the Anversian stage, or "Crag Noir," of the Belgian Miocene, which are developed at Edeghem and Antwerp. These two pelecypods occur in the Vindobonian strata of Europe, *P. menardi* being found as well in the Lenham Beds, Box-Stones, and Coralline Crag beds, whereas *Glycymeris pilosa* is found to frequent the same horizons, being likewise a member of the St. Erth fauna. Although acknowledging certain differences in the faunas of these Upper Tertiary horizons, which may be probably accounted for by different conditions of environment, no great disparity of time need be allowed for in considering their geological age. I am induced, therefore, from a knowledge of their conchology, to regard the Coralline Crag,[1] the St. Erth beds, and the Lenham Beds of Britain, together with the Diestian and the Anversian of Belgium, as of Upper Miocene age, and belonging to the stage Messinian or Mio-Pliocene, while the Box-Stones, or Nodule beds of East Anglia, I should consider as referable to the Vindobonian division of the Middle Miocene.

(To be concluded).

Limax tenellus in Shropshire. — In the *Journal of Conchology* for 1909 (vol. xii., p. 285), I referred to the occurrence of *Limax tenellus* in the oak woods of Wyre Forest, near Bewdley. The forest is situate on the confines of three counties—Worcester, Shropshire and Stafford—to the first of which my former record referred. In October, 1915, my friend Mr. J. Steele Elliott, with whom I was staying at Dowles, and I found the slug in the oak woods near his house, both in the parish of Arley, Staffordshire, and in the parish of Dowles, Shropshire. The specimens we took were referable to the var. *fulva*. *Limax tenellus* was found at Cheadle in North Staffordshire in 1909 by Mr. J. R. B. Masefield (*antea* vol. xiii., p. 42), but so far as I know it has not been taken hitherto in the south of the county nor in Shropshire.—CHAS. OLDHAM (*Read before the Society*, Dec. 8th, 1915).

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[1] The Foraminiferal evidence, also, lends support to the view that the Coralline Crag is of older age than has yet been accepted. According to the Monograph on the Crag Foraminifera by Jones, Burrows and others (Palæontographical Society, 1897, p. 369) the following species are recorded from the Coralline Crag of Sudbourne: *Nummulina planulata*, *Amphistegina vulgaris*, *Operculina complanata*, and *Orbitoides aspera*, formerly determined as *O. faujasi.* These are said to be "derived from earlier beds," although from a recent examination of the specimens, which are in the Geological Department of the British Museum, they present the appearance of having been found *in situ*. However, the so-called *Nummulina* might indicate an Eocene or Oligocene horizon, but the other organisms are characteristically Miocene, especially when it may be stated that in *Orbitoides aspera*, after careful rubbing down of the horizontal surface on the median plane of the figured example, there is exposed a series of minute chamberlets of squarish or hexagonal outline which can only belong to the Miocene genus *Lepidocyclina.*

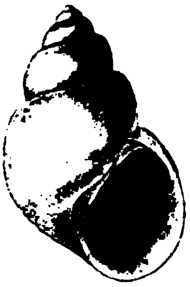
DESCRIPTION OF A NEW RISSOID SHELL FROM SOUTH AFRICA.

By J. R. le B. TOMLIN, M.A.

(Read before the Society Sept. 13th, 1916).

Microsetia durbanensis n.sp.

Shell minute, ovate-conical, narrowly perforate, rather opaque, smooth, white or yellowish-white; the upper whorls with the exception of the protoconch are frequently reddish-yellow, while the two last whorls are white; protoconch dull vitreous, rather obtuse; whorls about six in number, convex, and separated by a rather deeply-channelled suture; aperture oval or somewhat pear-shaped, not quite half the total length of the shell; peristome continuous, acute, not thickened; columella nearly straight and strongly callous over the umbilical perforation; operculum unknown.



Microsetia durbanensis n.sp.

Length, 2·4 mm.; diam. max., 1·5 mm.

Habitat: Durban, whence Mr. H. C. Burnup has sent numerous examples.

The type specimen figured has been deposited in the British Museum.

Unfortunately all the specimens collected so far have been dead ones. The surface of the shell seems very liable to corrode.

This species doubtless belongs to the same group as *Microsetia halia* Bartsch and *M. gisna* Bartsch.

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DESCRIPTION OF A NEW RISSOÏD SHELL FROM THE ANTARCTIC REGION.

By J. COSMO MELVILL, M.A., D.Sc., and R. STANDEN.

(Read before the Society, April 12th, 1916).

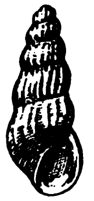
Onoba cymatodes sp. nov.

O. testa minuta, albida, fusiformi, delicata, angusta, anfractibus 7, *quorum apicales duo læves, planati, fortasse in specimine typico paullum detriti, cæteris apud medium tumescentibus, ad suturas multum impressis, undique longitudinaliter costis flexuosis ·arctè præditis, et spiraliter delicatissimè et arctissimè striatis, costis infra peripheriam anfractûs ultimi evanidis, apertura obtuse triangulata, labro paullum effuso, columella obliqua.*

Long., 2·55 mm.; lat., 1 mm.

Hab.: Burdwood Bank, south of the Falkland Isles. Coll.: W. S. Bruce, "Scotia" Expedition, 1905.

This interesting addition to the Antarctic fauna had, unfortunately, been accidentally omitted at the time of our writing the second portion of the Mollusca of the Scottish National Antarctic Expedition.[1] It is, though so minute, a well-marked species, white, narrowly fusiform, whorls centrally tumid or ventricose, suturally much impressed, seven-whorled, apex smooth and rounded, longitudinal riblets delicate, close together, and slightly obliquely flexuose, while only with a lens are the beautiful microscopic close spiral striæ, generally diffused over the surface, rendered perceptible. The mouth is obtusely triangular, a little recalling in this feature the considerably larger *Rissoina triangularis*[2] Watson, from Cape York, North-East Australia (of which we also sifted a good example from shell-sand collected in Magnetic Island, Queensland, by Mr. Arnold U. Henn).



Onoba cymatodes sp. nov.

After a prolonged search through a very large collection of this family, belonging to one of us, we have found no near ally to our new species, excepting *Onoba carnosa* Webster, 1905,[3] from New Zealand.

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[1] Trans. Royal Soc. Edinburgh, xlviii., part ii. (no. 18), pp. 333 sqq.

[2] Report "Challenger" Expedition, xv., p. 618, pl. xlvi., fig. 7.

[3] W. H. Webster, Trans. N.Z. Instit., xxxvii., p. 278.

The sculpture of this is similar, though the shell differs considerably in form, being much more abbreviate and oval. Mr. T. Iredale, in recently reviewing the New Zealand members of the *Rissoidæ* as given in Mr. H. Suter's new work,[1] has placed *O. carnosa* and *O. candidissima*, both of Webster, as the two true exponents of the European *striata* Montagu in that country, this being the original type of *Onoba* H. and A. Adams, 1852. We have compared *O. cymatodes* with this likewise, and are satisfied now with its generic position.

CENSUS AUTHENTICATIONS.

BY W. DENISON ROEBUCK, M.SC., F.L.S., HON. RECORDER.

All the records here given are based upon examples submitted to the official authenticators: myself for slugs only; Mr. F. Taylor for *Paludestrinidæ*; and Mr. John W. Taylor for all other species.

Bedfordshire: Mr. E. D. Marquand has submitted *Anodonta anatina*, several *Hyalinia pura* var. *nitidosa*, two *H. alliaria*, and a few *Pisidium amnicum*, all from Bedford.

Berkshire: Mr. J. R. le B. Tomlin sent a half-grown *Milax sowerbyi* from his garden in Reading, 6th June, 1916.

Galway South-East: Mr. J. K. Taylor has submitted numerous very small *Planorbis crista* var. *imbricata*, collected at Portumna by Mr. R. Welch.

Huntingdonshire: Mr. C. E. Wright has submitted *Sphærium lacustre*, taken at Offord in 1904.

Kerry South: Through the kindness of Mr. A. W. Stelfox a small *Hygromia hispida* var. *hispidosa*, taken at Cloghane, 25th Sept., 1910, has been seen.

Lancashire South: Mr. E. D. Marquand has submitted a few *Physa heterostropha* from Droylsden.

Lancashire West: Mr. J. Davy Dean has submitted *Helicella itala*, three of var. *grisescens*, Silverdale, Nov., 1904; *Vertigo alpestris*, Silverdale, 1905, several, and Borwick, Carnforth, May, 1908, several; *V. antivertigo*, several from Keer Estuary near Carnforth, Oct. 16th, 1909; *Clausilia laminata* from Warton Crag, Carnforth, numerous, Sept., 1909; *Cl. cravenensis*, same place and time, numerous and Yealand Redmayne, numerous, July 1906; also *Pisidium cinereum* from Lancaster Canal, Lancaster, several, 1904.

Co. Longford: We have seen by the benevolence of Mr. A. W. Stelfox an example of *Hygromia hispida* var. *albocincta*, taken at Tang Bridge, 5th April, 1910.

Lundy Island (Devon North): Mr. C. Upton has presented to the Voucher Collection a couple of *Helix aspersa* from this island.

Merionethshire: Mr. J. Davy Dean has submitted several examples of *Helix hortensis* var. *lutea* 00000, 12045, and 12345, from margins of oak wood at Barmouth, July, 1908.

Notts.: Prof. J. W. Carr has submitted *Acanthinula lamellata* from the holocene deposit at Wheatley. The species still remains to be detected in a living state in the county; this and the case of drift shells at Creswell Crags being the only evidence of its being a Notts. shell.

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[1] Manual of the New Zealand Mollusca, by Henry Suter, 1914.

SOME VARIETAL FORMS IN THE GENUS CYPRÆA.

By J. KIDSON TAYLOR.

(Read before the Society, Nov. 10th, 1915).

C. **variolaria** Lamk. [=*cruenta* Gmel.] var. **splendens** nov.

This variety differs from the type in having the dorsum much more brilliant in colour (a rich citron-brown), in the margins having the porcellanous deposit carried very much further over the back, this deposit being of a distinct violet tinge, covered with very numerous richly coloured spots of deeper violet; base yellow, interstices between the teeth bright orange.

Habitat: Japan and Seychelles.

C. **erosa** L. var. **galbula** nov.

This is a remarkable variety with white margins and dentition much more developed than in the type shell.

The dorsum is covered with brilliant orange deposit, clouded with suffused blotches of a darker colour and devoid of the usual white spots and annulated maculations: teeth very strong and coarsely developed.

Habitat: Seychelles.

C. **erosa** L. var. **pallens** nov.

In this variety the ground colour of the dorsum is of a very pale greenish-white colour covered with minute, very numerous white spots interspersed with a few annulated ones, very indistinctly defined; in other respects similar to the type.

Habitat: Ceylon.

C. **erosa** L. var. **lucida** nov.

A fine semi-pellucid form, delicately tinted with very pale fawn, slightly deeper in the centre of the dorsum, forming a faint band of colour, margins strongly incrassate, with the side blotches very indistinct. Dorsal white spots absent.

Habitat: Seychelles.

C. **esontropia** Duclos var. **pellucida** nov.

A variety differing from the type in having the entire surface of the shell semi-transparent, leaving the dorsal spots much less defined; base and lateral margins entirely white with no indication of spots as in the type shell.

Habitat: Hawaiian Isles.

C. rashleighana Melv. var. **eunota** nov.

Shell broadly pyriform with the lateral margins strongly developed, dorsum three-banded, the central band being the most distinctly defined, base white, very faintly spotted on the columella side, lateral margins white, very broad and heavily spotted with pale brown, these spots being carried well up the dorsum.

Dimensions of type: long. 18 mm., lat. 11 mm.; dimensions of var.: long. 18½ mm., lat. 13 mm.

Habitat; Hawaiian Isles.

C. rashleighana Melv. var. **transpiciens** nov.

Shell ovate-pyriform, much larger than the type; very pale straw colour (in one instance almost white), indistinctly three-banded, that in the middle, which is the most conspicuous, being interrupted or broken up into detached rectangular blotches; base white, lateral margins white, slightly thickened and sparingly punctured with pale brown spots.

The size is very much larger than the type, that of my specimens being:—long. 22½ mm., lat. 13½ mm.; long. 27½ mm., lat. 17 mm.; long. 27 mm., lat. 18½ mm.

Habitat: Honolulu, Hawaiian Isles.

According to Dautzenberg, this is the only form occurring in New Caledonia and Lifu.

I am indebted to Mr. J. C. Melvill for suggesting the names for the two varieties of *C. rashleighana*.

◆

EDITORIAL NOTES.

We regret greatly to have to record the death of Mr. E. A. Smith, I.S.O., on the 22nd July last, in his 69th year. We hope to publish some account of his life in our next number.

We have also to deplore the loss of another member of long standing, Mr. J. H. Ponsonby-Fane, better known by his original surname of Ponsonby, who died on the 11th September, at Brympton, Yeovil.

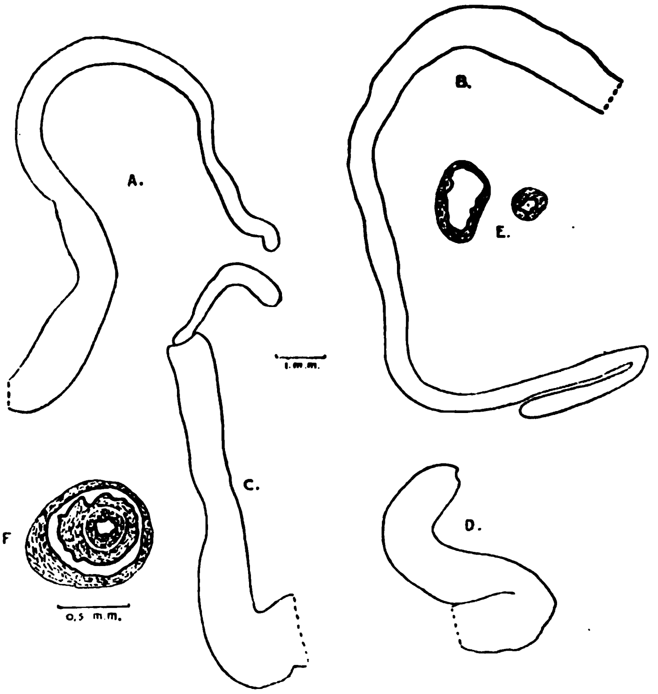
Two very well known French conchologists have also died comparatively recently:—Colonel Messager, of the Colonial Infantry, Commander of the Legion of Honour, died on December 4th, 1915, at his home at Rochefort-sur-Mer. He was best known for his researches in Tonkin. Dr. Pierre Marie Henri Fischer died on July 10th last, at 51, Boulevard St. Michel, Paris, at the age of fifty. He was editor of the *Journal de Conchyliologie*, and a member of very many learned societies.

NOTE ON THE GENITALIA OF THEBA CANTIANA Mont.

By A. E. BOYCOTT.

(Read before the Society, Dec. 8th, 1915).

So little is known of the physiology of the genital apparatus in mollusca that it seems worth while to record observations even as trivial as the following. As is well known (see *e.g.* C. Ashford, this *Journal*, vol. iv., p. 269 and plate x) *T. cantiana* has a long (about 17 mm.) thin tubular organ opening into the atrium: its homology is doubtful, it does not seem even to have a definite name and its function is, I believe, quite unknown. In June last, near St. Albans, I found a pair *in copula*: subsequent dissection showed that the act was so far complete that spermatophores had been exchanged and were found in the ducts and vesicles of the spermathecæ. The "doubtful organs" appeared abnormally short and bulky: they are shown at C and D in the figure compared with those (A and B) from two individuals exhibiting no signs of sexual activity, taken at



the same time and place. Closer examination suggested that this appearance was due to invagination or, more properly perhaps, intussusception, the process being more advanced, or less regressed, in D than in C. Transverse sections confirmed this view and showed clearly that the organs were folded up. F gives diagrammatically a section across D about the level of the distal flexure in figure D; the epithelial lining is shown in heavy black, the muscular wall streaked. The first space from the periphery is the lumen of the organ, the second the body cavity in which the organ lies, and the third the lumen of the organ more towards its tip. C shows this process of tucking in partly done. E shows sections of the normal organ. The magnification of A, B, C and D is given in A; the line under F refers to E and F.

These facts suggest that the "doubtful organ" may be everted and act as an excitatory organ or egersidium. It might perhaps be called an "atrial flagellum."

◆

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

452nd Meeting, held at the Manchester Museum, May 10th, 1916.

The President in the chair.

Additions to the Library announced and thanks voted:

"Manual of Conchology," part 92, by H. A. Pilsbry *(from the author)*; and the usual periodicals received in exchange.

Additions to the Autograph Letter Collection announced and thanks voted:

Messrs. Suter, Shaw, Nobre, Connolly, Farquhar, Barnard, Cregoe, Rolle, Dall, Bavay, and J. J. Walker. Donor: J. Ponsonby-Fane.

Donations to the Cabinet (per the Hon. Recorder):

From Capt. W. J. Farrer, Messrs. Chas. Upton, E. D. Marquand, and Cecil P. Hurst.

New Member Elected.

Giuseppe Despott.

Candidate Proposed for Membership.

Professor M. Doello Jurado, Museu Nacional, Peru 208, Buenos Ayres.

Papers Read.

"Note on *Coelocentrum gigas* von Mts.," by G. C. Spence.

"Notes on *Helix pisana* Müll., and its Occurrence at Porthcawl, Glamorgan," by J. Davy Dean.

"New Records for Pembrokeshire," by J. Davy Dean.

Exhibits.

By Rev. L. J. Shackleford: Nidamental capsules and embryos of *Pyrula perversa.*

By Mr. E. Collier: *Raphaulus chrysalis* Pfr. and *R. pachysiphon* Theob., from Moulmein, Burma; *Clausilia cylindrica* Gray, with perfect apices—a condition very rarely met with in this normally decollate species—from Simla; shells of *Parmacella valenciennesi* Webb, from Canary Isles, and *P. calyculata* Sow., from Gibraltar.

By Mr. C. H. Moore: *Euconulus fulvus* and *Hyalinia alliaria*, from Bury-me-Wick, near Stalybridge.

By Mrs. Gill: A series of *Purpura patula* L., showing growth-stages, from Philippines.

By Mr. G. C. Spence: Sixteen species of *Eucalodium*, including *Coelocentrum anomala* Strebel, and *Anisospira recticosta* (Pfr.).

By Mr. J. Davy Dean: Varieties of *Helix pisana*, *Acicula lineata*, and *Punctum pygmæum* to illustrate his papers.

In the Special Exhibit, the Genus *Pteronotus*, many species were shown from the collections of Mrs. Gill and the Manchester Museum.

453rd Meeting, held at the Manchester Museum, June 7th, 1916.

The President in the chair.

Additions to the Library announced and thanks voted:—

"La Science Française," 2 vols., Paris, 1915 (*from the editors*).

"Sur la présence du *Gulnaria peregra* Müll. var. *sinistrorsa* au Danemark et dans le nord de l'Allemagne," by Hans Schlesch (*from the author*); and the usual periodicals received in exchange.

New Member Elected.

Prof. M. Doello Jurado.

Candidate Proposed for Membership.

Hamilton E. Quick, M.B., F.R.C.S., 51, Bryn Road, Swansea (introduced by Dr. E. le Cronier Lancaster and Lewis J. Shackleford).

Paper Read.

"On the supposed occurrence of *Jaminia triplicata* Studer in Suffolk," by J. Davy Dean and J. R. le Brockton Tomlin, M.A.

Exhibits.

By Mr. C. H. Moore: *Opeas goodalli* from a conservatory at Stamford Park, Stalybridge.

By Mr. J. W. Jackson: *Caecilioides acicula* from Mill Dale, Staffordshire.

By Mrs. Gill: A large series of species from Tanganyika and Victoria Nyanza.

In the special exhibit of the *Labyrinthus* section of *Pleurodonte* a considerable number of species was shown by Mrs. Gill, Messrs. Collier and Standen, and from the Manchester Museum collections. Mr. Collier also exhibited the sections *Isomeria* and *Gonostomopsis*, pointing out the affinities and general characteristics of this interesting group of *Helicidæ*.

ON A SUPPOSED NEW SPECIES OF LIMICOLARIA.

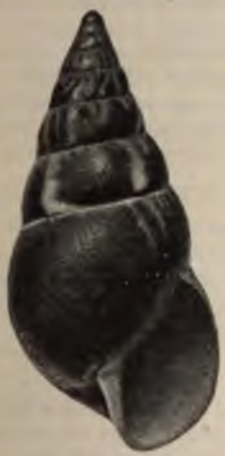
By Rev. L. J. SHACKLEFORD and G. C. SPENCE.

(Read before the Society, 8th Dec., 1915).

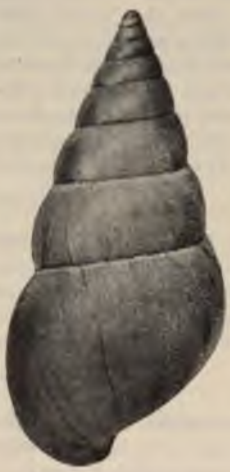
Owing to the kindness of Mr. Robert Standen two specimens of *Limicolaria* have recently come into our hands. We have hesitated long before adding a new name to the already formidable list comprised in this genus. The shells, however, are very distinct, and as far as we can ascertain the species has not been previously described. Mr. E. A. Smith did not know it, although he informed us that there are specimens, unnamed, in the Nat. Hist. Mus., S. Kensington.

Limicolaria abinsiensis sp. nov.

Shell narrowly but deeply perforate, acutely conic-ovate, rather solid, somewhat shining, nepionic whorls smooth, remainder distinctly and evenly sculptured with curved striæ, decussate with impressed spiral lines fairly strong on upper portions of whorls, but becoming almost obsolete below the periphery. Ground colour pale yellow, excepting the apex which is pink, handsomely marked with warm dark chestnut-coloured flames, some of which are forked and all extend across the whorls to the suture. These flames are narrow and regularly spaced at first but gradually become wider and



Limicolaria abinsiensis sp. nov.



Var. *aurea* nov.

coalesce on the body whorl, which, including the base, is a uniform dark chestnut with the exception of two or three narrow lighter streaks, marking growth periods. Whorls 10, convex, and separated by a finely crenulate and, on the body whorl, beaded suture, white above and pale brown below.

Aperture vertical, auriform, angulate above and below, dark blue within, edged on the outer margin with brown; columella vertical, expanded over the perforation, purple; outer lip thin, the margins joined by an extremely thin film of callus, showing the colouration of the body whorl through same.

Length, 59 mm.; diam. 27.5 mm. Aperture, 25 × 13.5 mm.

Var **aurea** nov.:—Similar to type, but of a uniform golden yellow. Sculpture a little stronger.

Locality: Abinsi, Benué River, Northern Nigeria.

The type specimens are in the collection of G. C. Spence.

◆

Note on Cœlocentrum gigas von Mts.—There is in my collection the newly hatched, but now unfortunately defunct, shell of *C. gigas* von Mts. from Livingston, Guatemala. This has a dome-shaped top, parallel sides and square cut base, and consists of four whorls, of which the first one-and-a-half are smooth. Strong riblets then appear below the suture whilst on the fourth whorl rather weaker riblets appear on the lower edge and join, though very weak in the centre tract, with those on the upper edge to form hemispherical riblets. Suture deep, the third and fourth whorls somewhat overhanging and angled. Central column hollow and swollen within each whorl as in the adult, but I cannot detect any vertical ribbing. Colour pale horn, clear and semi-transparent. Height 3 mm.; diam. 2.75 mm.—G. C. SPENCE (*Read before the Society*, May 10th, 1916).

New Records for Pembrokeshire.—I cannot find any mention of *Acicula lineata* Drap. or of *Punctum pygmæum* Drap. for this county, v. c. 45, and am glad therefore to be able to record that I took both species last September at Saundersfoot, in the beautiful woods of silver oak and birch to the west of the bay. —J. DAVY DEAN (*Read before the Society*, May 10th, 1916).

Preservation of Land Shells.—Many land shells that have been badly cleaned, or are too minute to clean properly, get covered with a very objectionable fungoid growth which if allowed to remain destroys the shell completely or gives it a worn appearance. To overcome this I have been using lately a mixture of linseed oil, benzol and thymol in about the following proportions:—10 per cent. of linseed oil; 90 per cent. of benzol; 2 grammes of thymol crystals. This mixture penetrates the inside of the shells and gets into all small orifices, and all growths disappear. The proportion of linseed oil can be reduced for small spinous shells and increased to give a lustre to big shells, including marine shells.—B. R. LUCAS (*Read before the Society*, Feb. 9th, 1916).

THE

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Corrected to Dec. 26th, 1916.

(With year of election; O = founder, or original member; L = Life Member; P = has filled the office of President; *post packets have been returned undelivered).

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1908. Balch, F. N., 60, State Street (Rooms 504-507), Boston, Mass., U.S.A.
1911. Barnard, K. H., B.A., South African Museum, Capetown.
1913. *L* Bartlett, H. F. D., F.E.S., 1, Myrtle Road, Bournemouth.
1907. Bartsch, Dr. Paul, Smithsonian Institution, Washington, D.C., U.S.A.
1907. Bavay, A., 82, Rue Lauriston, xvi^{e}, Paris.
1905. Becker, Dr. H., F.L.S., F.S.A., Grahamstown, Cape Colony.
1901. Beeston, Harry, Sunnymead, South Street, Havant, Hants.
1904. Benn, C. A., M.A., F.G.S., Moor Court, near Kington, Herefordshire.
1901. Bentley, R. H., 60, Rosebery Road, Muswell Hill, N.
1897. Blackburn, Rev. E. Percy, Berrister House, Raunds, Northants.
1897. Blake, Wm. Charles, 2, Acacia Villas, Ross, Herefordshire.
1895. Bles, Edward J., M.A., D.Sc., Elterholm, Madingley Road, Cambridge.
1897. Bliss, Joseph, Boar Bank Hall, Grange-over-Sands.
1907. Bloomer, H. H., 40, Bennett's Hill, Birmingham.
1899. Blundell, Mrs. Jessie M., Argyll House, Cirencester.
1910. Booker, H. H., 153, Albert Road, Heeley, Sheffield.
1904. Booth, Fred, 18, Queen's Road, Shipley, Yorks.
1884. Bostock, Edwin D., Oulton Cross, Stone, Staffordshire.
1906. Boult, J. W., 50, Washington Street, Newland, Hull.

1897. *PL* **Boycott**, Professor A. E., M.A., D.M., F.R.S., 17, Loom Lane, Radlett.
1908. **Brainerd**, Mrs. H. D., Captiva, Lee Co., Florida. U.S.A.
1900 *L* **Broadbent**, Dr. G. H., Lynwood, 74, Denton Rd., Audenshaw, Manchester.
1899. **Brooksbank**, Hugh, M.B., College Road. Windermere.
1905. **Bromehead**, C. N., Geological Survey and Museum, Jermyn Street, London, S.W.
1911. **Brown**, Edmund R., 237, Brunswick Street, Manchester.
1913. **Bryan**, B., 176, Uttoxeter Road, Longton, Staffs.
1897. **Burnup**, Henry Clifden, Box 182 P.O., Maritzburg, Natal.
1879. **Butterell**, J. Darker, Manor House, Wansford, Hull.
1906. **Butterfield**, W. Ruskin, Corporation Museum, Hastings.
1902. **Button**, Fred. L., Bacon Building, Oakland, California, U.S.A.

1906. *L* **Carpenter**, Geoffrey D. H., B.A., M.B., c/o P.M.O., Entebbe, Uganda.
1913. **Carr**, Professor G. W., University College Museum, Nottingham.
1903. **Cattell**, W. Chas., The Poplars, Montagu Street, Kettering.
1915. **Challis**, Miss Bertha, State Museum, University of Washington, Seattle, Washington, U.S.A.
1913. **Chalmers**, J., c/o The Hon. Secretary.
1892. **Champ**, Hy., c/o S. & J. Watts & Co., Portland Street, Manchester.
1889. **Christy**, Miller, F.L.S., Broom Wood Lodge, Chignal St. James, Chelmsford, Essex.
1904. **Clapp**, Geo. H., Corner 7th & Bedford Aves., Pittsburgh, Pa., U.S.A.
1913. **Clapp**, W. F., 25, Ware Street, Cambridge, Mass., U.S.A.
1886. **Coates**, Henry, F.R.S.E., Corarder, Perth.
1880. **Collier**, Edwd., Glen Esk, Whalley Range, Manchester.
1898. *PL* **Collinge**, Walter E., D.Sc., (M.Sc.) Berne, F.L.S., F.E.S., The University, St. Andrews, Scotland.
1913. **Connolly**, Major M., Gresham Cottage, Brentwood.
1901. **Cooke**, Rev. Alfred H., M.A., D.Sc., F.Z.S., Aldenham School, Elstree, Herts.
1892. **Cooper**, James Eddowes, Grangemount, 9, Duke's Avenue, Church End, Finchley, N.
1890. **Crawford**, James, c/o J. C. Kemsley and Co., Port Elizabeth, Cape Colony.
1910. **Cribb**, C. Theodore, Woodrufle, 14, Corfton Road, Ealing, W.
1899. **Crowther**, J. E., Portland Street, Elland, Yorks.

1897. **Dacie**, John Charles, 30, Montserrat Road, Putney, S.W.
1913. **Dalton**, E. N., 62, The Avenue, Highams Park, Chingford.
1899. **Darnbrough**, Frederick, 4, Clyde Terrace, Yarm Road, Stockton-on-Tees.
1913. **Davey**, W. J., 19, Allfarthing Lane, Wandsworth Common, S.W.
1916. **Davies**, W. H., 22, Pine Grove, Monton, Eccles, Lancs.
1909. **Dawes**, L., Hambledon, Old Headington, Oxford.
1915. **Day**, Henry, M.Sc., Clifton Terrace, Hayfield Road, Chapel-en-le-Frith.
1915. **Deakin**, Percy T., c/o J. W. Moore, 151, Middleton Hall Road, King's Norton, Birmingham.
1898. **Dean**, J. Davy, 2, Northcote Street, Cardiff.
1916. **Despott**, Giuseppe, Valletta University, Malta.
1909. **Dickson**, Robert Cecil, M.B., Ch.B., 29, Strathmartine Road, Dundee.
1909. **Diver**, Cyril, The Birches, Haslemere.
1907. **Dupont**, Evenor, Hell-Bourg, Réunion.
1910. **Dyke**, F. M., B.Sc. (Lond.), Nelson Croft, Church Rd., Bebington, Cheshire.

1895. **Edwards**. Thos., 247, Narborough Road, Leicester.
1901. **Edwards**, W. H., Hastings Museum, Victoria Institute, Worcester.

1891. Elgar, Hubert, Museum and Public Library, Maidstone.
1904. *L* Eliot, Sir Chas., K.C.M.G., Vice-Chancellor, University, Hongkong.
1884. Elliot, Edward J., High Street, Stroud, Gloucestershire.
1910. Elliott, W. T., D.D.S., F.Z.S., Arden Grange, Tamworth-in-Arden, Worcs.
1913. Emmett, H., 156, Moston Street, Hanley, Staffs.
1894. Evans, Wm., F.R.S.E., 38, Morningside Park, Edinburgh.

1897. *L* Farquhar, John, 3, Rose Terrace, African Str., Grahamstown, Cape Colony.
1891. Farrer, Captain Wm. James, 1, Courtney Road, Southport.
1897. Fielding, Clement, M.P.S., Clover Hill, Halifax, Yorks.
1915. Firth, J. Digby, F.L.S., F.E.S., Boys' Modern School, Leeds.
1884. *L* Fitzgerald, Rev. H. Purefoy, F.L.S., Lidwells, Goudhurst, Kent.
1912. *L* Frames, P. R., P.O. Box 148, Johannesburg, S. Africa.
1905. Freeman, William, Hawkhurst, Milton Road, Oundle.
1892. Fulton, Hugh, River Side, Kew, near London.
1913. Fysher, Greevz, 78, Chapel Allerton Terrace, Leeds.

1907. *L* Gabriel, Charles J., 297, Victoria Street, Abbotsford, Victoria, Australia.
1914. Gardiner, Alan, B.Sc., The Bridge House, Bradfield College, Berks.
1913. Gauntlett, H. L., M.R.C.S., L.R.C.P., A.K.C., 39, Oakhill Road, Putney, S.W.
1911. Geiser, Samuel W., Upper Iowa University, Fayette, Iowa, U.S.A.
1887. Gerland, Conrad, M.Sc., Ph.D., F.C.S., Meadow Bank, Accrington.
1908. Gill, Mrs. A. E., Dinant Cottage, 1, Claude Road, Chorlton-cum-Hardy.
1916. Gladstone, John S., Nanhurst, Cranleigh, Surrey.
1886. *L* Godlee, Theo., Whips Cross, Walthamstow, Essex.
1906. Gomez, A. da Costa, 201, St. James' Place, Brooklyn, N.Y., U.S.A.
1904. Gray, Arthur F., Exchange Building, 53, State St., Boston, Mass., U.S.A.
1904. Grierson, P. H., St. Kevins, Bray, co. Wicklow.
1890. Gude, G. K., F.Z.S., 9, Wimbledon Park Road, S.W.
1907. Gyngell, Walter, 13, Gladstone Road, Scarborough.

1909. Haas, Dr. Fritz, Senkenbergisches Museum, Victoria Allee, 7, Frankfurt-am-Main.
1910. Hadden, Norman G., c/o The Editor of *Journal of Conchology.*
1895. Hann, Rev. Adam, 842, Chester Road, Stretford, Manchester.
1895. Hardy, John Ray, The Museum, The University, Manchester.
1887. Hargreaves, J. A., 40, North Marine Road, Scarborough.
1913. Harman, A., 5, Harley Street, Scalby Road, Scarborough.
1909. Harrison, Richard, 79, Upper Duke Street, Hulme, Manchester.
1889. Hartley, Alfred, 19, Thorpe Garth, Idle, near Bradford, Yorks.
1887. Harvard, T. Mawson, 4, Queen's Leaze, Forest Hill, S.E.
1907. Hawkins, H. L., University College, Reading.
1903. Hawkins, John, J.P., 35, Avenue Road, Grantham.
1887. Heathcote, Wm. Henry, F.L.S., The Marsh, Longton, Preston, Lancs.
1907. Henderson, J. B., jr., 16th Street and Florida Avenue, Washington, D.C., U.S.A.
1913. Heller, Julius, Villa Gisela, Teplitz, Bohemia.
1887. Hey, Thomas, 8, Bloomfield Street, Derby.
1895. Hibbert, Charles R. C., South Close, Landcross, Bideford, Devon.
1895. *P* Hickson, Prof. Sydney J., D.Sc., M.A., F.R.S., University, Manchester.
1886. *L* Hillman, Thomas Stanton, Eastgate Street, Lewes, Sussex.
1907. Hindley, R. T., The Green Way, Macclesfield.
1906. Hirase, Y., Karasumaru, Kyoto, Japan.

1911. Hitchon, Mrs. Susan A., Rhyddington, Oswaldtwistle, Lancs.
1891. *P* Horsley, Rev. Canon J. W., M.A., Detling Vicarage, Maidstone.
1907. Horwood, A. R., Leicester Museum and Art Galleries, Leicester.
1907. Howard, Vernon, Carlton Lodge, Eastgate, Louth.
1884. Howell, George O., 210, Eglinton Road, Plumstead, Kent.
1892. Howorth, Sir Henry Hoyle, K.C.I.E., M.P., F.R.S., etc., 30, Collingham Gardens, London, S.W.
1886. *P* Hoyle, W. E., M.A., D.Sc., The National Museum of Wales, Cardiff.
1909. Huggins, Henry C., 17, Clarence Place, Gravesend.
1911. Humphreys, Griffith, 1, Belsize Avenue, London, N.W.
1915. Hurst, C. P., Treowen, Berrow Road, Burnham, Som.
1905. Hutton, W. Harrison, 44, Dial Street, Leeds.

1913. Ingrams, Lieut. W. H., 7th The King's Shropshire Light Infantry, c/o G.P.O., London.

1901. Jackson, J. Wilfrid, F.G.S., The Museum, The University, Manchester.
1912. Jenkinson, Charles, 1, High Street, Kettering.
1891. Jenner, James Herbert Augustus, F.E.S., Eastgate House, Lewes.
1912. *L* Jewell, Miss F., Emsworth, Hants.
1906. Johnson, Chas. W., Boston Society of Natural History, Boston, Mass., U.S.A.
1908. Jolliffe, J. E. A., Kingsley, Barnham, near Bognor.
1894. Jones, Fleet-Surgeon K. H., M.B., Ch.B., F.Z.S., R.N., The Manor House, St. Stephen's, Canterbury.
1916. Jurado, Professor M. D., Museu Nacional, Peru 208, Buenos Ayres.

1907. Kendall, Rev. C. E. Y., 190, Lincoln Road, Peterborough.
1897. *L* Kennard, A. S., Benenden, Mackenzie Road, Beckenham, Kent.
1914. Kennedy, Lieut. J. Noble, 119th Heavy Battery, B.E.F., France.
1902. *L* Kensett, Percy F., Broadmeadow, Coombe Lane, Wimbledon, S.W.
1897. Kenyon, Mrs. Agnes Fleming, 291, Highett St., Richmond, Melbourne, Victoria.
1889. Knight, Rev. G. A. Frank, M.A., F.R.S.E., 52, Sardinia Terrace, Hillhead, Glasgow.

1901. * Laidlaw, F. F., M.A., Cranston's Ivanhoe Hotel, Bloomsbury St., London, W.C.
1899. Lancaster, Ernest Le Cronier, B.A., M.B., Winchester House, Swansea.
1879. Laver, Henry, M.R.C.S., F.L.S., Head Street, Colchester, Essex.
1894. *L* Lawson, Peter, Jesmond, Nella Rd., Fulham Palace Rd., Hammersmith, W.
1905. * Laycock, John, Sidney, Manitoba, Canada.
1900. Lebour, Miss M. V., Radcliffe House, Corbridge-on-Tyne, Northumberland.
1911. Leman, George C., Wynyard, 152, West Hill, Putney, S.W.
1910. Levett, Rev. T. T., F.Z.S., Frenchgate, Richmond, Yorks.
1899. Lightfoot, Robert M., South African Museum, Cape Town.
1909. Linton, Mrs., Ye Olde Mill House, Castle Hill, Northallerton.
1908. Longstaff, Mrs. G. B., F.L.S., Highlands, Putney Heath, S.W.
1912. Loyd, L. R. W., 17, Sandringham Court, Maida Vale, W.
1898. Lucas, B. R., F.G.S., Winnington Park, Northwich, Cheshire.
1910. * Lucas, F. R. Tindall, Tewin Vale, Welwyn.
1891. Lyons, Lady, Kilvrough, Parkmill, R.S.O., Glamorganshire.

1906. Macindoe, Dr. A., D.P.H., Sidmouth, Devon.
1911. MacLeod, D. J., Hof Ter Meere, 13, Reigerstraat, Ghent, Belgium.
1911. March, Miss M. C., M.Sc., Healey Grove, Burnley, Lancs.
1885. Marquand, Ernest D., A.L.S., The Willows, Totnes, Devon.
1887. Marshall, J. T., c/o Editor of *Journal of Conchology*.
1915. Martin, George A., Highdene, St. Nicholas, near Cardiff.
1887. *P* Masefield, John R. B., M.A., Rosehill, Cheadle, Staffordshire.
1904. Massy, Miss A. L., Tredagh, Malahide, co. Dublin.
1905. Maxwell, Mrs. Miller, Bangholm Bower, Goldenacre, Edinburgh.
1889. Mayfield, Arthur, Mendlesham, Stowmarket, Suffolk.
1914. Mazyck, W. G., Hon. Curator, Charleston Museum, S. Carolina, U
1903. McClelland, Hugh, The Manor House, Berkswell, near Coventry.
1914. McMurtrie, Rev. John, M.A., The Manse, Skene, Aberdeenshire.
1880. *P* Melvill, James Cosmo, M.A., D.Sc., F.L.S., Meole Brace Hall, Shrev
1904. Milne, James N., Foylemore, St. Jude's Avenue, Belfast.
1906. Monterosato, Il Marchese di, 2, Via Gregorio Ugdalena, Palermo, S
1910. Moorcock, J., 91, Broadfield Road, Catford, S.E.
1902. *L* Moore, Chas. H., 103, Mottram Road, Stalybridge.
1908. Moore, Albert J., 9, Brook Street, Hull.
1907. Morey, Frank, F.L.S., Wolverton, Carisbrooke Rd., Newport, Isle of
1912. Murdoch, G. H., 49, Parliament Hill, Hampstead, N.W.
1906. Murdoch, R., Wanganui, New Zealand.
1907. Musham, J. F., F.E.S., Haylands, Brook Street, Selby, Yorks.

1905. * Napier, H. C., 15, The Common, Woolwich.
1911. Nash, Rev. E. H., M.A., Wetley Rocks Vicarage, Stoke-on-Trent.
1903. Nash, P. B., Bruce Mines, Algona, Ont., Canada.
1891. *P* Newton, Richard Bullen, F.G.S., 11, Twyford Crescent, Acton Hill
1891. *P* Norman, Rev. Canon Alfred Merle, D.C.L., F.R.S., etc., Th House, Berkhamsted.
1901. Norton, Miss E. M., 20, Eastfield Road, Westbury-on-Trym, near B
1915. Norwood, Mrs. Gilbert, 4, The Glen, Saundersfoot, Pembrokeshire.

1887. Oldham, Charles, The Bollin, Shrublands Road, Berkhamsted.
1910. Oliver, A. M., West Jesmond Villa, Newcastle-on-Tyne.
1896. Overton, Harry, The Newlands, Boswell Road, Sutton Coldfield.
1905. *L* Owston, Alan, Yokohama, Japan.

1904. Parritt, H. W., 14, Stanhope Gardens, Highgate, N.
1902. Pattison. Ernest, 52, Saxe Coburg Street, Leicester.
1886. Pearce, Rev. S. Spencer. M.A., Long Combe Vicarage, near Wooc Oxfordshire.
1913. * Pellow, N. E., 432, Stratford Road, Sparkhill, Birmingham.
1901. Penrose, G., Royal Institution of Cornwall, Truro.
1907. Petty, S. L., Dykelands, Ulverston, Lancs.
1908. Phillips, R. A., Ashburton, Cork.
1913. Pickard, Bertram, Tregenna, Mansfield.
1913. Presbrey, E. W., 17, Trinity Place, New Rochelle, N.Y., U.S.A.
1897. Preston, Hugh B., F.Z.S., Hôtel de France, Huelgoat, Finisterre, F
1907. Priske, R. A. R., 9, Melbourne Avenue, West Ealing, Middlesex.
1906. *L* Pritchard, G. B., F.G.S., 38, Mantell Street, Moonee Ponds, Victor
1916. Pye, Alfred W., Mortagne, Dudley Street, Grimsby.

1916. Quick, Capt. Hamilton E., M.B., F.R.C.S., 51, Bryn Road, Swansea.

1906. *L* Radley, Percy E., F.R.M.S., 30, Foxgrove Road, Beckenham. Kent.
1899. Ramanan, Vedaraniam Venkata, M.A., F.Z.S., 12, Sami Pilla Street, Triplicane, Madras, S. India.
1906. Reynell, Alexander, Brackley, Crofton Lane, Orpington, Kent.
1905. Reynolds, Laurence R., 233, Aspinwall Avenue, Brookline, Mass., U.S.A.
1913. Rhodes, F., 113, Heaton Road, Manningham, Bradford, Yorks.
1900. Richards, C. P., Mission House, Stenalees, St. Austell, Cornwall.
1906. * Ritchie, John, jr., Box 2795, Boston, Mass., U.S.A.
1898. Roberts, A. William Rymer, The Common, Windermere.
1913. Roberts, J. W., 145, Withington Road, Whalley Range, Manchester.
0 *P* Roebuck, W. Denison, M.Sc., F.L.S., 259, Hyde Park Road, Leeds.
1901. Rooth, J. A., M.R.C.S., 6, Richmond Terrace, Brighton.
1893. Roseburgh, John, Market Square, Galashiels, Roxburgh.
1892. Rosevear, John Burman, 109, New King's Rd., Fulham, S.W.
1910. *L* Rowe, A. W., M.S., M.B., M.A.C.S., F.G.S., Shottendane, Margate.

1914. Saban, Alfred J., 318, Ivydale Road, Peckham Rye, S.E.
1906. Salisbury, Albert E., 12a, The Park, Ealing, W.
1877. *P* Scharff, Robert F., Ph.D., M.R.I.A., Knockranny, Bray, co. Wicklow.
1906. Schepman, M. M., Bosch en Duin, Huister Heide, Utrecht, Holland.
1895. *L* Schill, C. H., Crosten Towers, Alderley Edge.
1886. Scott, Thomas, LL.D., F.L.S., The Laboratory, Bay of Nigg, Fishery Board for Scotland, Aberdeen.
1893. Shackleford, Rev. Lewis John, Taranaki, Vernon Avenue, Blackpool.
1910. *L* Shaw, H. O. N., B.Sc., F.Z.S., Wissett Hall, Halesworth, Suffolk.
1904. Shaw, Rev. W. A., Peper Harow Rectory, Godalming.
1906. Shopland, Commander E. R., Cecilia House, The Avenue, Lowestoft.
1910. Shrubsole, George, Elm Bank, Workington, Cumberland.
1895. Sich, Alfred, F.E.S., Corney House, Chiswick, W.
1905. Simpson, James, c/o G. Sim, Esq., A.L.S., 52, Castle Street, Aberdeen.
1902. Smallman, Raleigh S., Eliot Lodge, Albemarle Road, Beckenham.
1892. Smith, Mrs. Louisa J., Monmouth House, Monmouth St., Topsham, Exeter.
1899. *L* Smith, Mrs. Lucy A., Cricklade Street, Cirencester.
1907. Smith, Maxwell, Hartsdale, Westchester Co., New York, U.S.A.
1894. Smith, Wm. Chas., 92, Dawes Road, Fulham, S.W.
1900. Solly, E. H., Lea Orchard, Ottinge, Elham, near Canterbury.
1886. Sowerby, Geo. Brettingham, F.L.S., 36, Ennerdale Rd., Richmond, Surrey.
1907. Spence, G. C., 10, Pine Grove, Monton, Eccles, Lancs.
1914. Stainton, Ernest, 70, Jubilee Road, Doncaster.
1906. Stalley, Henry J., Thorntona, Oxted, Surrey.
1886. *P* Standen, Robert, The Museum, The University, Manchester.
1911. Standish, C. M., Prospect House, Weldbank, Chorley.
1915. Steenberg, C. M., Mag. Sc., Royal Observatory, Ostervoldgade, 3, Copenhagen.
1903. *L* Stelfox, A. W., Ballymagee, Bangor, co. Down.
1906. Step, Edward, F.L.S., Oakwood House, Ashstead, Surrey.
1910. Stephenson, H. L., 90, Tempest Road, Beeston Hill, Leeds.
1908. *L* Stobart, H. J. S., Belbroughton, Stourbridge.
1896. Stonestreet, Rev. W. T., B.D., F.R.S.L., Arnholm, 268, Hornby Road, Blackpool.
1897. Stracey, Bernard, M.B., 26, De Montfort Street, Leicester.

1890. Stubbs, Arthur Goodwin, The Meads Cottage, Hailey Lane, Hertford.
1893. Stump, Edward C., Balgownie, Rochdale Road, Blackley, Manchester.
1912. Sturt, E. G. M., Lismore, Cavendish Road, Weybridge.
1912. Sturt, G. L., Lismore, Cavendish Road, Weybridge.
1895. Swanton, E. W., The Educational Museum, Haslemere, Surrey.
1888. P Sykes, Ernest Ruthven, B.A., F.L.S., Longthorns, Blandford.

1910. Tattersall, W. M., D.Sc., The Museum, The University, Manchester.
1895. Taylor, Frederick, 32, Landseer Street, Park Road, Oldham, Lancs.
1907. Taylor, G. H., School House, Higher Blackley, Manchester.
1904. L* Taylor, Gerald Medland, Rossall School, Fleetwood.
1907. Taylor, J. Kidson, 45, South Avenue, Buxton.
1904. Taylor, Thos., Middlemore Avenue, Mangere, Otahuhu, New Zealand
1903. Thaanum, D., 5, Church Street, Hilo, Hawaiian Islands.
1908. Thomas, Rev. R. E., M.A., St. Martin's Clergy House, Salisbury.
1907. L Thornton, H. G., Kingsthorpe Hall, Northampton.
1886. L Tomlin, J. R. le Brockton, M.A., F.E.S., Lakefoot, Reading.
1906. Turton, Lt.-Col. W. H., D.S.O., R.E., 80, Caledonia Place, Clifton, Bristol.

1907. Upton, Charles, Rooksmoor, Tuffley Avenue, Gloucester.

1914. Van der Sleen, Dr. W. G. N., Eidenoutstraat, 63, Haarlem, Holland.
1915. Van Hyning, T., Curator, Florida State Museum, Gainesville, Fla., U.S.A.
1899. Vaughan, J. Williams, J.P., Pen-y-maes, Hay, *via* Hereford.
1897. Vignal, Louis, 28, Avenue Duquesne, Paris.
1902. Vincent, W. C. W., 39, West Bank, Stamford Hill, London, N.

1898. Wakefield, H. Rowland, 7, Montpelier Terrace, Swansea.
1891. Walker, Bryant, 1306, Dime Bank Building, Detroit, Michigan, U.S.A.
1907. Wallis, E. A., Springfield, West Parade, Scarborough.
1900. L Watson, Hugh, Bracondale, The Avenue, Cambridge.
1908. Weaver, G. H., 31, Devonshire Road, Palmer's Green, N.
1900. Webb, Walter F., 202, Westminster Road, Rochester, N.Y., U.S.A.
1902. Weeks, Wm. H., jr., 508, Willoughby Avenue, Brooklyn, N.Y., U.S.A.
1895. Welch, Robert John, M.R.I.A., 49, Lonsdale Street, Belfast.
1913. Western, W. H., 9, Redearth Road, Darwen.
1907. Wheat, Silas C., 987, Sterling Place, Brooklyn, N.Y., U.S.A.
1916. Whitwell, John W., 39, Queen's Way, Wallasey.
1886. Whitwell, Wm., Brookside, Darley Knowle, Warwickshire.
1911. * Williams, James M. M., Imperial House, Pontlottyn, Cardiff.
1889. Williams, John M., 31, Grove Park, Liverpool.
1915. Wilman, Miss M., The McGregor Museum, Kimberley, South Africa.
1913. Winckworth, Ronald, 37, Upper Rock Gardens, Brighton.
1890. Wood, Albert, Midland Lodge, Sutton Coldfield.
1910. Woodcock, R., Fauvic, Jersey.
1901. L Woodruffe-Peacock, Rev. E. A., F.L.S., etc., Cadney, Brigg, Lincs.
1911. Woods, Rev. F. H., B.D., Bainton Rectory, Driffield.
1898. Woods, Henry, M.A., F.G.S., Sedgwick Museum, Cambridge.
1886. L Woodward, Bernard B., F.L.S., etc., 4, Longfield Rd., Ealing, W.
1903. Worsdale, R., 102, Dudley Terrace, Dudley Road, Grantham.
1914. Worsfold, Herbert W., 28, Melody Road, Wandsworth, S.W.
1895. Wright, Charles East, Neale Avenue, Kettering.

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ON THE CONCHOLOGICAL FEATURES OF THE LENHAM SANDSTONES OF KENT AND THEIR STRATIGRAPHICAL IMPORTANCE.

(Concluded from page 118).

By R. BULLEN NEWTON, F.G.S.,[1]
OF THE BRITISH MUSEUM.

(Presidential Address delivered at the Annual Meeting, October 16th, 1915).

In accordance with these views, therefore, the following synopsis of the various geological horizons referred to is now proposed :—

Recent		British and Mediterranean Seas
Post-Pliocene	Glacial, etc.	Britain
Pliocene	Norwich Crag	
	Red Crag (=Astian of Italy and Scaldisian of Belgium)	
Upper Miocene or Messinian (=Pontian or Mio-Pliocene)	Coralline Crag	
	Diestian	Belgium
	St. Erth Beds (Cornwall)	Britain
	Lenham Sandstones	
	Anversian (="Crag Noir" of Edeghem and Antwerp)	Belgium
	Upper Miocene	Germany (N.)
Middle Miocene (=Vindobonian)	Redonian (=Tortonian or Anversian)	France (N.W.)
	Box-Stones (=Bolderian of Belgium)	Britain
	Helvetian–Tortonian	Italy; Vienna Basin; Holland; Denmark, etc.
Lower Miocene	Burdigalian	France (S.W.)
	Aquitanian	Italy.

Lastly, I may mention that in 1907 I was favoured with a visit from the late Prof. Dr. Gottsche, Director of the Hamburg Museum, and one of the chief authorities on the molluscan fauna of the North German Miocene deposits, for the purpose of examining the Lenham Collection of the Museum of Practical Geology, which was then in my keeping at the British Museum ; he was specially interested in some specimens referred to in Mr. Reid's memoir as an elongated variety of *Triton heptagonum*?, being confident that they represented

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FOOTNOTE.—While the last fasciculus of this work is being passed for press, the author has most regretfully to announce the death of Mr. Clement Reid, F.R.S., which took place on Sunday, December 10th, 1916, in his 64th year. Mr. Reid was for many years on the staff of the Geological Survey of England, and during his career had written many memoirs on geological subjects. So far as we are at present concerned, it may be stated that his name will be for ever inseparably associated with the history of the Lenham Beds as described in his "Pliocene Deposits of Britain."

Beyrich's *Fusus sexcostatus*, a characteristic fossil of the Upper Miocene formation of North Germany. He was further of opinion that the Lenham beds were older than had hitherto been supposed, and he considered that they should be referred to the Miocene period.

EXPLANATION OF PLATES.

The figures are of natural size unless otherwise specified. The letters M.P.G. or B.M. indicate that the specimens figured are either in the Museum of Practical Geology or in the British Museum (Geological Department). The British Museum specimens were chiefly collected and presented by Mr. Graham Wallas, while a few were obtained in exchange from Mr. A. S. Kennard, F.G.S.

PLATE I.

Pelecypoda (extinct).

CHLAMYS PRINCEPS J. de Sowerby, sp.

Fig. 1.—Umbonal region of a left valve, showing external characters. From a gutta-percha model.

Fig. 2.—Magnified view of the costal rays of same specimen, with scabrous ornamentation. [M.P.G., No. 404].

HINNITES CRISPUS Brocchi, sp.

Fig. 3.—Lateral view of fragmentary left valve, in which the costæ are more regular and equi-distant in the early stage than during the subsequent period of growth; obscure spinous thickenings are traceable on the later costæ. From a gutta-percha model. [M.P.G., No. 401].

TELLINA BENEDENI Nyst and Westendorp.

Fig. 4.—A natural internal sandstone cast of a right valve, exhibiting the ovately trigonal contour of this species, the adductor scar impressions, and the extensive pallial sinus. [B.M., Graham Wallas Coll.].

ARCOPAGIA VENTRICOSA Serres, sp.

Fig. 5.—Lateral aspect of a right valve, showing the close and well-marked concentric costæ associated with fine and equi-distant radial striations. From a gutta-percha model.

Fig. 6.—Magnified portion of surface of same specimen, exhibiting a latticed structure. [M.P.G., No. 425].

PLAGIOCARDIUM HIRSUTUM Bronn, sp.

Fig. 7.—Externo-lateral view of a right valve, showing the narrow sulcations between the costæ. From a gutta-percha model.

Fig. 8.—Magnified surface of same, indicating the squamose character of the costæ. [M.P.G., No. 420].

PANOPÆA MENARDI Deshayes.

Fig. 9.—Left lateral aspect of specimen with parts (dorsal region) of both valves in the closed condition, showing the elongately concentric growth lines and obscure evidence of irregular radial striations. From a gutta-percha model. [M.P.G., No. 428].

CYRTODARIA ANGUSTA Nyst and Westendorp, sp.

Fig. 10.—Left lateral view of specimen with both valves in the closed state, preserved as a natural sandstone cast. The valves are very compressed and posteriorly produced. [B.M., No. L., 24065].

ASPIDOPHOLAS RUGOSA Brocchi, sp.

Fig. 11.—External view of a left valve with traces of the umbono-ventral suture dividing it into two parts. From a gutta-percha cast. [M.P.G., not numbered].

PLATE 2.

Pelecypoda (extinct).

TAPES PEROVALIS S. V. Wood.

Fig. 1.—Lateral view of a left valve with elongately oval contour and distant concentric growth lines. From a gutta-percha model. [M.P.G., No. 434].

ASTARTE GALEOTTII Nyst.

Fig. 2.—A fragmentary left valve, showing the numerous close concentric costæ of this species. From a wax impression × 2. [B.M., Graham Wallas Coll.].

ASTARTE OMALII Lajonkaire.

Fig. 3.—Lateral aspect of a left valve, showing an ovate trigonal contour, strong concentric ridges, and a sub-angulate posterior margin. From a gutta-percha model × 2. [M.P.G., No. 416].

ASTARTE BASTEROTI Lajonkaire.

Fig. 4.—External aspect of a right valve in which the concentric costæ are more prominent over the umbonal surface than elsewhere.

Fig. 5.—An enlarged figure of the same specimen × 2½. From a wax impression. [B.M., Graham Wallas Coll.].

ASTARTE MUTABILIS S. V. Wood.

Fig. 6.—Right lateral view of specimen with closed valves, furnished with distant growth lines, and possessing a nearly horizontal ventral margin.

Fig. 7.—Dorsal view of same, showing pronounced convexity of the valves and well-marked lunule. From a gutta-percha model. [M.P.G., not numbered].

ANADARA DILUVII Lamarck, sp.

Fig. 8.—External view of a right valve, showing the strong, radial costæ and deep sulcations, concentric striæ, and the more or less distant growth lines. From a gutta-percha model. [M.P.G., No. 410].

MARGARITIFERA PHALAENACEA Lamarck, sp.

Fig. 9.—Natural sandstone cast, showing the summit region of a left valve, the rectilinear hinge-line, the inflated umbonal area, and the nearly vertical anterior side. [M.P.G., No. 409.]

SPISULA ARCUATA J. Sowerby, sp.

Fig. 10.—Lateral view of a left valve, preserved as a sandstone cast, with its ovate-trigonal contour, obtusely-ridged posterior region, and obscure lines of growth. [M.P.G., No. 429].

Fig. 11.—Cardinal fragment of the left valve of another specimen, showing compressed umbo, the lateral teeth, and the prominent trigonal cavity for the reception of the ligament. From a gutta-percha model. [M.P.G., No. C.R. 1260].

GLANS SENILIS Lamarck, sp.

Fig. 12.—External aspect of a left valve, showing an obliquely cordate shape, and furnished with convex and robust ribs, possessing obscure squamose sculpturing. From gutta-percha model. [M.P.G., No. 417].

CYPRINA RUSTICA (?) J. Sowerby, sp.

Fig. 13.—Natural sandstone cast of a fragmentary left valve, with a cordate-globose contour, a well-defined lunuloid area, and a widely truncated posterior side. [M.P.G., No. 421].

GASTRANA LAMINOSA J. de C. Sowerby, sp.

Fig. 14.—Latero-dorsal view of a fragmentary left valve of about medium size, showing the long posterior margin; associated in same block of sandstone with an example of *Panopea menardi.*

Fig. 15.—Magnification of sculpture of same specimen displaying the concentric costæ and numerous fine radial striations. From gutta-percha model. [M.P.G., No. 428].

OSTREA PRINCEPS S. V. Wood.

Fig. 16.—An external view of a small example of this species, occurring as a sandstone cavity, showing the strong, squamose radial costæ. From a gutta-percha model. [M.P.G., No. 402].

BARNEA CYLINDRICA J. Sowerby, sp.

Fig. 17.—A fragmentary right valve of small size, showing its cylindrical contour and the elongate-concentric ridges crossed by fine striations and best seen at the anterior end. From a gutta-percha model, × 1½. [M.P.G., No. C.R. 1274].

YOLDIA OBLONGOIDES S. V. Wood, sp.

Fig. 18.—Natural sandstone cast of fragmentary left valve, showing the minute denticles on each side of the umbo, × 2.

Fig. 19.—A similar cast of a right valve. [B.M., Graham Wallas Coll.].

Fig. 20.—External view of a right valve, with concentric growth-lines. From a gutta-percha model. [M.P.G., No. 426].

PLATE 3.

Gastropoda (extinct).

STREPTOCHETUS SEXCOSTATUS Beyrich, sp.

Fig. 1.—Dorsal view of specimen showing the equi-distant and convex longitudinal costæ and the spirally threaded ornamentation of the whorls. From a gutta-percha model, × 2. [M.P.G., No. 469].

Fig. 2.—Latero-dorsal aspect of another specimen. From a gutta-percha model, × 2. [M.P.G., No. 451].

PTYCHOPOTAMIDES TRICINCTUS Brocchi, sp.

Fig. 3.—View of specimen showing the triple rows of granulations on each whorl. From a wax impression. [B.M., Kennard Coll.].

DRILLIA OBELISCUS Des Moulins.

Fig. 4.—Lateral view showing the longitudinal costæ crossed by fine spiral striations, and the narrowly banded suture. From a gutta-percha model. [M.P.G., No. 459].

Fig. 5.—Enlarged view of same specimen, × 2.

Fig. 6.—Another and more slender example of the same species. From a wax impression. [B.M., Graham Wallas Coll.].

EUMARGARITA TROCHOIDEA S. V. Wood.

Fig. 7.—Summit view exhibiting four volutions.

Fig. 8.—Basal aspect of same specimen showing the deep and marginally angulate umbilicus. From wax impressions. [M.P.G., No. 452].

CLAVATULA JOUANNETI Des Moulins, sp.

Fig. 9.—Dorsal view exhibiting depressed whorls, a marginal thickening at the suture, and spiral striations. From a gutta-percha model. [M.P.G., No. 460].

Fig. 10.—Another example of more conoidal contour. From a wax impression. [B.M., Graham Wallas Coll.].

TURRIS TURRIFERA Nyst, sp.

Fig. 11.—Dorsal aspect of a medium-sized example, showing the obtusely-margined whorls and contour of this species. [M.P.G., No. 461].

Fig. 12.—The anterior portion of last whorl of same specimen in which the oblique and rather distant spiral striations are seen, as well as obscure sinuous growth lines, × 2.

Fig. 13.—Magnified structure of same, exhibiting obtuse carinations at the suture. From wax and gutta-percha models.

PYRAMIDELLA PLICOSA Bronn.

Fig. 14.—Dorsal view of specimen with smooth and gradually increasing whorls, an impressed suture, and a central subangulated basal whorl. From a wax impression, × 2. [B.M., Graham Wallas Coll.].

XENOPHORA CRISPA (?) König, sp.

Fig. 15.—Natural sandstone cast, showing the broad depressed volutions, and the wide cavities which had formerly contained agglutinated shell fragments, etc. [M.P.G., No. 15879].

TEREBRA ACUMINATA Borson.

Fig. 16.—Specimen showing the slightly raised sutural bands and the longitudinal flexuose striations. From a gutta-percha model. [M.P.G., No. 468].

BONELLITIA SERRATA Bronn, sp.

Fig. 17.—Dorsal aspect of specimen with inflated whorls, deep suture, and well marked clathrate sculpture. From a gutta-percha model, × 2. [M.P.G., No. 444].

ZARIA SUBANGULATA Brocchi, sp.

Fig. 18.—Portion of spire showing depressed volutions but subcarinate in the early stages, with sculpture consisting of close

and thread-like spiral striations. From gutta-percha model, × 2. [M.P.G., No. C.R., 1277].

Fig. 19.—Dorsal view of another specimen with a slightly more oblique suture. From a gutta-percha model. [M.P.G., No. 474].

MACULOPEPLUM LAMBERTI J. Sowerby, sp.

Fig. 20.—Natural sandstone cast of an anterior fragment of an adult form of this species. [B.M., Graham Wallas Coll.].

RINGICULELLA LENHAMENSIS sp. nov.

Fig. 21.—Apertural view showing sub-cylindrical form with nearly parallel sides, biplicated columella, and smooth surface. From a gutta-percha model, × 1½. [M.P.G., No. 465].

Fig. 22.—Dorsal aspect of a larger specimen, showing well-produced spire, and the thickly margined outer-lip. From a gutta-percha model, × 1½. [M.P.G., No. 465].

MUREX BADENSIS Nyst.

Fig. 23.—View of an imperfect specimen, with deeply sutured, angulate whorls bearing distant ridge-like vertical costæ, and obscure spiral striations. From a gutta-percha model. [M.P.G., No. 464].

Fig. 24.—Enlarged view of same specimen, × 2.

PLATE 4.

Gastropoda and Pelecypoda (existing) and Brachiopoda (extinct).

PYRULA RETICULATA Lamarck.

Fig. 1.— A fragmentary sandstone cast, showing the rounded summit region, and the strong equi-distant spiral region, as well as the close and fine vertical striations. [M.P.G., No. 463].

Fig. 2.—Anterior fragment of another specimen, with more definite sculpture characters. From gutta-percha model. [M.P.G., No. 463].

SEMICASSIS SABURON Bruguière.

Fig. 3.—Dorsal view of a sandstone cast, showing the elongately oval body-whorl (spire not preserved), and furnished with a wide groove bordering the outer margin of the aperture, which represents the thick reflected lip. [M.P.G., No. 442].

BOREOTROPHON CLATHRATUS Linnæus, sp.

Fig. 4.—Natural sandstone cast of a dorsal view, showing the equidistant longitudinal costæ, prominent sulcations, and short anterior canal. [B.M., Kennard Coll.].

SCALA SUBULATA J. de C. Sowerby, sp.

Fig. 5.—Dorsal aspect of specimen with eight inflated whorls, possessing distant, oblique, lamelliform costæ, otherwise the surface is smooth. From a gutta percha model, × 2. [B.M., Prestwich Coll.].

CAPILUNA GRÆCA Linnæus, sp.

Fig. 6.—External view exhibiting the familiar clathrate sculpture formed by the radial and concentric costæ. From a gutta-percha model. [M.P.G., No. 450].

Fig. 7.—Sandstone cast of interior of another specimen, showing the oblong perforation and remains of radial striations at the basal margin. [M.P.G., No. 450].

EMARGINULA FISSURA Linnæus.

Fig. 8.—Lateral aspect of an example with the typical latticed sculpture, × 2. From a gutta-percha model. [M.P.G., No. 448].

PAPILLICARDIUM PAPILLOSUM Poli, sp.

Fig. 9.—External view of a right valve, showing the minutely papillose costæ and the concentrically striated furrows. From a wax impression. [B.M.., Graham Wallas Coll.].

Fig. 10.—Magnified surface ornamentation of same specimen.

VOLSELLA BARBATA Linnæus, sp.

Fig. 11.—External view of a right valve, showing the numerous concentric wrinklings or ridges of this species with obscure radial striæ. From a wax impression. [B.M., Graham Wallas Coll.].

ISOCARDIA HUMANA (= COR) Linnæus, sp.

Fig. 12.—Right lateral aspect of a small example with closed valves preserved as a natural sandstone cast, showing interna characters. The figure gives a much foreshortened view o the specimen to exhibit the involute umbo and prominen lunuloid cavity. [M.P.G., No. 15878].

MANUPECTEN PESFELIS Linnæus, sp.

Fig. 13.—External view of a right valve indicating the closely fas-culate character of the riblets.

Fig. 14.—Magnified sculpture of same, showing microscopical striæ and punctations. From a gutta-percha model.
[M.P.G., No. 407].

TEREBRATULA PERFORATA Desnoyers.

Fig. 15.—A sandstone cast of a pedicle valve, showing internal features, muscular scars, elongate divergent striations (= pallial grooves), and numerous concentric growth lines.
[M.P.G., No. 400].

Fig. 16.—Front view of summit region of same specimen, showing the large perforation and oblique lateral margins.

Fig. 17.—A fragmentary internal cast of another specimen, belonging to the basal region, in which the radial striations are very numerous, as well as the lines of growth, which are nearly horizontal in the centre, and so indicating biplication of the frontal region. [M.P.G., No. 400].

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The "Nerita jaculator" of O. F. Müller and Paludestrina.—Some specimens of *Paludestrina jenkinsi*, collected in Hertfordshire, in a pond near Elstree, in September, 1915, gave a good demonstration of their method of extruding the young, while under observation in a dish. The snail being in the customary crawling position, the shell is suddenly jerked upwards and forwards (i.e., as if the animal were beginning to withdraw) at intervals of perhaps a quarter or half a minute, three or four times in succession. At each jerk a small white body is shot out into the water with a vigour sufficient to carry it half an inch or so horizontally. On examination these white bodies proved to be young ones. This "spectaculum mirum et jucundum" was apparently seen by O. F. Müller on 16th July, 1769 (*Vermium Historia*, vol. ii. (1774), p. 186); he gives a lively account of the expulsion of the small white bodies, and his subsequent failure to recover them for microscopic examination, and is so indignant that a snail of such remarkable powers should be named after the tentacles which any common mollusc has, that he deliberately renames it "juculator." It is true that I noticed nothing like the resolution of the bodies into anything which was suggestive of the tiny worms he mentions, and Müller may have been observing something quite different, but the general similarity at any rate suggests that he may have included *Paludestrina* with *Bithinia*.—A. E. BOYCOTT (*Read before the Society*, Nov. 8th, 1916).

OBITUARY NOTICE:
EDGAR ALBERT SMITH, I.S.O.

By J. COSMO MELVILL, M.A., D.Sc.

(Read before the Society, Sept. 13th, 1916).

AFTER a severe illness of some duration, we have to mourn one standing in the very foremost rank of malacologists, in the person of Edgar Smith, so well known to and honoured by all who have, during the best part of fifty years, sought his ever-ready help and guidance at the British Museum of Natural History.

The third and youngest son of the late Mr. Frederick Smith, for many years Assistant-Keeper of the Zoological Department, British Museum, who died in February, 1879 (the leading authority on British Hymenoptera, and a former President of the Entomological Society of London), he possessed, indeed, a hereditary instinct, and, from the very outset of his career, followed in the paternal footsteps, soon becoming an adept, firstly in those branches of natural science in which his father reigned supreme, and exhibiting a readiness to grasp the knotty problems of critical differentiation and variation. Hardly ever, if ever, have the conclusions he had so carefully arrived at in his subsequent molluscan studies been questioned; his descriptive and other work will, we are confident, remain unassailed—an imperishable monument of his acumen and accuracy of detail.

Born on 29th November, 1847, he was barely twenty years of age when he entered upon his duties at the Museum as an assistant in the Zoological Department in 1867, a few years antecedent to the retirement of Dr. John Edward Gray, F.R.S., the then Keeper of Zoology, a household word in almost every branch of natural science, including the mollusca.

Sir Richard Owen, K.C.B., F.R.S., was still Superintendent of the whole Natural History Department, and for long his influential energies had been directed towards a great scheme for the removal of these collections to a National Museum to be erected in South Kensington. Indeed the building had commenced, with Mr. Alfred Waterhouse as architect, but was not finally complete and opened to the public till 1881.

In 1866-7 the vast collections of shells formed by the late Hugh Cuming, during his world-wide travels, were purchased for the nation for £6,000; and one of the first duties of the young assistant was to enter upon the examination, begin the cataloguing, and further the arrangement of these large accessions to the existing collections, unfortunately already cramped for room at the old quarters. It was, therefore, not possible to make much headway until 1881, when the new buildings were completed, as we have just stated above.

Smith then found ample scope for what he had long desired: and the planning of the new cases and ultimate design of the arrangement was undoubtedly to him a thoroughly congenial task. The multitudinous number of types, especially in the Cumingian Collections, places the stores at South Kensington on a higher plane than those in any other museum in the world, perfect though many of them be, as regards the mollusca; and Smith was justly proud of what was his special care. One of his most interesting pamphlets, written specially by order of the Museum authorities, is devoted to an exposition of the growth of these collections, and names the authors whose types are to be found there.

In 1895 Edgar Smith was promoted to be Assistant-Keeper; in 1903 he received the distinction of the Imperial Service Order (I.S.O.). In 1913, on completing his sixty-fifth year, he retired from his official duties; but a room was specially allotted to him, in which he might continue to prosecute his researches, and carry out descriptive and other work. His freedom of action being thus unimpeded, his many friends hoped that for a long time to come he might elucidate many knotty points and add to knowledge out of his stores of long experience; and so, for two years or so, he remained at the Museum with advantage to all concerned. But, alas! the time was not to be prolonged. His health began to fail about August or September, 1915, and on 22nd of July last he passed away at his house in Mill Hill Park, Acton, in his sixty-ninth year.

In July, 1876, he married Miss F. Travers, and she, with four sons and two daughters, survives him.

He is credited with being the author of about three hundred papers, including monographs, geographical and faunistic treatises, reports of scientific expeditions, and descriptive writings.

His first publications, so far as I can ascertain, were in 1871; [1] "A List of the Genus *Planaxis*, with Descriptions of Eleven New Species"; and in the same year [2] "A Catalogue of West African Shells with Descriptions."

His last, shewing that he worked to the very end, were published in March, 1916: "On some Pelecypoda from the Philippines," and "On South African Species of *Sepiidæ*," both in the Proceedings of the Malacological Society, of which body he was for years the Editor of Reports, and also had filled the Presidential Chair, 1901–3. He had likewise served as President of the Conchological Society of Great Britain and Ireland, 1889–90.

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[1] Ann. and Mag. Nat. Hist., ix., pp. 37—46.

[2] Proc. Zool. Soc., 1871, pp. 727—739, pl. lxxv.

Besides several genera he must have described over two thousand species of recent shells, say one in twenty-four of those known to exist.

Amongst his most important monographs, undoubtedly his three contributions to the "'Challenger' Expedition" memoirs come first, as follows:—

[1] (*a*) Land and Freshwater Molluscs - 1884.
[2] (*b*) Lamellibranchiata - - - 1885.
[3] (*c*) Heteropoda - - - - - 1888.

The second of these being the most voluminous by far.

A few titles of other faunistic papers now follow:—

"The Mollusca of the Various Voyages of S.S. 'Alert' and 'Discovery."

[4] (*a*) To the Polar Seas - - 1875–76.
[5] (*b*) To Straits of Magellan and Patagonia } 1876.
[6] (*c*) To Indo-Pacific Ocean - 1881–2.

Zoology of Voyage of H.M.S. 'Erebus' and 'Terror,' under the command of Sir James Clark Ross, 1839–43.

Mollusca, 4 plates - - - - 1874.

Mollusca in Transit of 'Venus' Expedition, 1877, in Transactions Royal Society, principally from Kerguelen-land.

[8] Report on Zoological Collections made by the Officers of H.M.S. 'Flying Fish' at Christmas Island, Indian Ocean, 1887.

[9] Report on Land and Freshwater Shells collected by Dr. Emin Pasha in Central Africa.

[10] Report on the Marine Molluscan Fauna of St. Helena.

[11] Natural History Notes from the Indian Marine Survey, R.I.M.S. 'Investigator': Report on the Mollusca dredged in the Bay of Bengal and Arabian Sea, ten papers.

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[1] Proc. Zool. Soc., 1884, pp. 258—261, pl. xxii., xxiii.

[2] Report 'Challenger' Exped., Zoology, xiii., part 35, pp. 1—341, xxxi. plates.

[3] l.c., xxiii., part 72, 51 pp.

[4] Narrative by Sir George Nares. London, 1878, 8vo., vol. ii., pp. 223—233

[5] Proc. Zool. Soc., 1881, pp. 22—44, pl. iii.—v.

[6] Report Zool. Collection H.M.S. 'Alert' and 'Discovery' during 1881—2. London, 1884, pp. 32—116, pl. iv—vii., and l.c., pp. 487—508, pl. xliv.

[7] Trans. Roy. Soc., 1877, 26 pp., pl. ix.

[8] Proc. Zool. Soc., 1887, pp. 507—526, pl. xiv.

[9] Ann. and Mag. Nat. Hist., vi., 1890, pp. 146—168.

[10] Proc. Zool. Soc., 1890, pp. 247—317, pl. xxi.—xxiv.; also ib., 1892, pp. 250—270.

[11] A full list is given in Ann. and Mag. Nat. Hist., ser. 7, vol. xviii., p. 157, Sept., 1006,

Report of a Collection made in the Antarctic Regions during the Voyage of the "Southern Cross."

Mollusca, pp. 201–213, pl. xxiv., xxv. London, 1902.

National Antarctic Expedition, S.S. 'Discovery.' Nat. Hist., vol. ii., Mollusca and Brachiopoda, part iii., pp. 1–12, 1907.

[1] Land and Freshwater Mollusca of Uganda, 1902.

[2] List of Species of Mollusca from South Africa, 1903.

[3] Fauna and Geography of the Maldive and Laccadive Archipelagoes, 1903.

[4] On a Collection of Shells from Tanganyika and Nyassa, East Africa. Proc. Zool. Soc., 1881, pp. 276–300, pl. xxxii.–xxxiv., 1881.

On the Freshwater Shells of Australia. Journ. Linn. Soc., xvi., pp. 255–317, pl. v.–vii., 1882.

List of Australian *Mactridæ*, with New Species. Proc. Malac. Soc., xi., 1914, pp. 137–151.

On the Supposed Similarity between the Mollusca of the Arctic and Antarctic Regions: Presidential Address, Malacological Society, London, 1902.

Some Remarks on the Mollusca of Lake Tanganyika: Presidential Address, Malacological Society, London, 1904.

[5] Diagnoses of new *Pleurotomidæ*, *Terebridæ*, etc., in the Collections of the British Museum.

Among genera of recent shells reviewed, revised, and monographed by him we find

Planaxis, *Scutus*, *Myodora*, *Gouldia*, *Chilina*, *Astarte*, *Melapium*, *Lobiger*, *Sphenia*, *Clea*, *Pirula*, *Voluta* (*Africæ meridionalis*), *Vanikoro*, *Erato*, *Tellina* (*Sectio Strigilla*).

It only remains to say that he was a Fellow of the Zoological Society of London, and a Corresponding Member of the Linnean Society of New South Wales and of the Academy of Natural Sciences, Philadelphia.

As written by Mr. J. Ponsonby-Fane, in a letter I received from him in July, the loss of Edgar Smith is "to his friends irreparable, to molluscan science international."

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[1] The Uganda Protectorate, H. H. Johnston. I., pp. 449—453. London, 4°, 190

[2] Proc. Malac. Soc. London, v., pp. 354—402.

[3] Vol. ii., pp. 589—630, pl. xxxv. and xxxvi.

[4] The first of four papers devoted to the extraordinary freshwater mollusca of this region.

[5] Ann. and Mag. Nat. Hist., vol. xix. (1877), pp. 225—8, 488—501; ib., vol. x. (1882), pp. 206—218, 296—306; ib., vol. xiv. (1884), pp. 317—329; ib., (1888), pp. 300—317.

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ON THE CALCAREOUS EGGS OF TERRESTRIAL MOLLUSCA.

(Presidential Address delivered at the Annual Meeting, October 14th, 1916).

By ROBERT STANDEN,
ASSISTANT-KEEPER OF THE MANCHESTER MUSEUM.

No class of animals possesses more variety or curious complexity of the reproductive system than the mollusca, and the study of the various methods exhibited in the deposition of their eggs has long been a source of attraction to me. More especially has this been the case with those species producing eggs with calcareous shells, which admit of ready preservation as an interesting adjunct to a collection, but are largely neglected by amateurs. Some time ago, on the occasion of one of the pleasant re-unions of northern conchologists, held periodically at the Manchester Museum, I exhibited some of my snails' eggs, and gave a short paper upon them. This was so much appreciated, that I have decided to again take up the subject as the theme of my Presidential Address, confining my remarks entirely to the calcareous eggs of certain groups of terrestrial mollusca, in an attempt to roughly summarise the extent of our present knowledge of them, as evidenced by the recorded notes and observations of various conchologists.

References to the eggs of land shells—whether calcareous or otherwise—are very scanty in the works of the older conchological writers, and then usually limited to a casual mention of eggs of the larger species of *Bulimus*, *Achatina*, or *Acavus*. Latterly, however, more attention has been given to them by modern authors, so that in the writings of Tryon, Pilsbry, Hedley, E. A. Smith, Suter, and others, we find detailed descriptions, sometimes accompanied by figures, of a number of species. But at present the total number of known kinds of eggs, as compared with the vast array of described species of exotic land shells, is very insignificant. I am pleased to see that special attention is being given to the oviposition of our native species by Mr. J. W. Taylor in his "Monograph of British Mollusca."

The eggs of snails rapidly increase in size after deposition. This is especially noticeable in those with membranous envelopes, but is also observable in the calcareous kinds which rapidly acquire opacity and hardness, through the gradual deposition of innumerable limy particles over the whole *inner* surface of the egg. These particles attain a maximum development in the *Helicidæ*, and assume the form of regular rhomboidal crystals of carbonate of lime. In some species these crystals form an exquisite microscopic object. This state of regular crystallisation is not so pronounced in other cases where the lime is deposited in grains, as in the eggs of birds, or the bones of vertebrates. A certain amount of flexibility is absolutely necessary in the large calcareous eggs of some species to allow of their passage through the comparatively narrow aperture of the parent shell. A case in point is that of *Acavus skinneri* Rve., whose egg some time after extrusion cannot be inserted into the shell from whence it came.

The eggs of most of the naked snails or slugs are soft, semitransparent, and destitute of calcareous crystals. The genus *Arion* affords a notable exception. The egg of *Arion ater* L. has a soft membranous envelope when first laid, but this soon becomes opaque through the deposition of immense numbers of minute calcareous particles on the interior. The same thing occurs in the genus *Cryptella*, from the Canary Isles, but, as in *Arion*, the crystals are ill-formed and exhibit the rhomboidal figure very imperfectly. I may here remark that such eggs as these cannot well be preserved in a dry state owing to shrinkage, the amount of calcareous matter secreted being insufficient to give the envelope the requisite stability.

In form, the calcareous eggs of snails are, for the most part, oval, elliptical, or spheroidal. None show the well defined "big and little ends" observable in the eggs of many birds. The egg of *Columna flammea* Martyn, from Principe Island, is ovate-oblong or kidney-shaped, 14 mm. in length.

The colour of calcareous eggs is usually white, in varying shades, but in many of the *Achatinidæ* it is a peculiar shade of yellow. In *Paryphanta hochstetteri* Pfr. it is fulvous. Some eggs recently received from Bombay are rose-pink, but as the shells to which they belong are not yet to hand I cannot give the species.

In size, the eggs of snails vary as much as the animals which produce them, but it does not necessarily follow that from a large shell a proportionally large egg may be expected. Study of the apex—the part formed within the egg, and known variously as the "protoconch," "nucleus," "dome," or "nepionic whorls" of any shell gives us a fairly accurate idea of the approximate size of the egg belonging thereto, when the egg itself is not forthcoming for comparison. It is to the large-domed species we must therefore turn for correspondingly large eggs, in which the embryo undergoes a greater amount of development within the egg, which contains a considerable amount of nutriment; consequently the individual eggs are of large size and few in number.

The oviparous land snails generally care for their eggs by placing them in situations where they will not only be safe from injury, but also open to the influence of air and heat, and in close proximity to the food which the young will require when hatched. The majority deposit their eggs in excavations which they hollow out to varying depths in the ground at the foot of trees, under leaves, or amongst grass roots, where they will receive a certain amount of warmth and moisture; whilst some are deposited underneath stones or logs. By keeping *Helix pomatia* L. in captivity, the manner in which the burrowing snails excavate their nidus can readily be demonstrated, and, apart from the interest of watching the operation, there is every chance of obtaining the hard-shelled, dull-white, globular eggs, measuring 6 mm. in diameter—the largest egg produced by a British snail. Some curious deviations from the usual method of depositing the eggs occur in a few families. *Cochlostyla mindoroënsis* Brod., for instance, which alone, according to Cuming, of all the arboreal snails inhabiting the Philippines, has calcareous eggs, deposits them upon a leaf in parallel rows, each standing perpendicularly on end, attached at the base by a glutinous substance. In others of the same family the eggs are soft, and are deposited in a bag, which the parent snail twists up for their reception from the leaves of the tree upon which it lives. *Libera fratercula* Pease and its congeners, from the Society and Cook's Islands, are described by Pease as remarkable for their habit of ovipositing into the cavernous umbilicus of the shell, which is strongly constricted below so as to form a pouch-like cavity within; into this the eggs to the number of from four to six, or the same number of embryonic shells when hatched, are closely packed. By some of the species in this genus they are still more effectively retained in position by a temporary shelly plate, which partially covers the umbilical opening, and is subsequently broken away or absorbed by the animal to facilitate the escape of the young shells. *Pseudachatina downesii* (Gray) and its allies, from West Africa, lay their eggs in the axils of the branches of the trees upon which they live. *Testacella haliotidea* Draparnaud deposits its eggs here and there in its subterranean galleries, sometimes a yard or more beneath the surface.

Hyalinia is the only group, as far as I know, which seems to make no sort of provision for the welfare of its eggs, which are simply dropped singly here and there amongst moss or herbage, and left to chance. This appears to be the normal procedure in each species, though I have on one occasion taken a specimen of *H. cellaria* (Müll.) under a log in the act of laying, with a little pile of ten eggs beside it. The eggs are spherical, dull-white, calcareous, and 1·5 mm. in diameter. The eggs of *H. lucida* (Drap.) are practically indistinguishable from those of *H. cellaria* (Müll.). The eggs of *H. alliaria* (Miller) are round, pure white, 1·5 mm. in diameter; those of *H. nitidula* (Drap.) are spherical, opaque-white, rather glossy, and are 1·5 mm. in diameter. *Zonitoides nitidus* (Müll.) has opaque-white eggs, sub-globular in shape, measuring 1·5 × 1 mm.; they are usually deposited singly, but sometimes in little clusters of four to six.

The eggs of *Testacella haliotidea* Drap. are 6 × 4·4 mm., with opaque yellowish-white calcareous shells, oblong-oval in shape, eventually becoming somewhat pointed at both ends. In *T. maugei* Fér. the eggs are acuminate-oval in shape, white, but gradually become yellowish. The eggs of *Testacella* are peculiar in that, although enclosed in a hard calcareous shell, when removed from the ground and placed upon the hand, or in a warm place, they explode with a perceptible noise; but they may be preserved if plunged at once into boiling water. This is an equally good method of destroying the vitality in other species of eggs too small to empty by "blowing."

The eggs of *Paryphanta busbyi* Gray, from New Zealand, are white, regularly oval, surface granular, and measure 13 × 11 mm. Suter states that they are generally laid at the foot of large trees, underneath dead leaves. In *P. urnula* Pfr. the egg is white, roundly-ovate, very finely granular, 5·25 × 4·4 mm. *P. hochstetteri* Pfr. has a roundly-oval egg, finely granular, colour fulvous; dimensions 10 × 8·5 mm. *Schizoglossa novoseelandica* Pfr. has white hard-shelled eggs, coarsely granular, 4 × 3 mm. They are usually deposited under a good thickness of decaying fern leaves in little heaps of from six to fourteen.

In such of the ovoviviparous species as have calcareous eggs, they are arranged in succession in the upper part of the oviduct down which they descend as developed. The egg-shell becomes dissolved or is consumed by the embryo, which uses up the limy material in building its own shell. The latter attains a considerable size before extrusion from the parent.

According to Pilsbry, some of the species of *Thysanophora*, *Sagda*, and *Zaphysema* have been found with hard-shelled eggs in the oviduct. In *Sagda haldemaniana* Ad. they are short oval, white and smooth. Of the eggs of *Oleacina* I can find no mention, except Tryon's remark that the genus is oviparous, has elliptical, white eggs, with calcareous, roughened shells. I have eggs of *Glandina fusiformis* Pfr., from Mexico; they are white, elliptical, and measure 8·5 × 5·25 mm. *Varicella glabra* Pfr., from San Juan, has white, elliptical, calcareous eggs, with slightly pointed ends, the shell covered with a raised pattern of interrupted lines.

Pyramidula rotundata (Müll.) has white, opaque, ellipsoidal eggs, not quite a millimetre in their longest diameter. They seem to be deposited from early spring to late autumn in little clusters of eight to fifteen, and may often be met with under rubbish, dead leaves, etc. *Helix aspersa* Müll. lays from forty to one hundred eggs, roundly-oval in shape, 4·5 × 4 mm., with a tough membranous cuticle, thickly coated with limy crystals, which, however, do not give the eggs the firmness of those of *H. pomatia*. *H. nemoralis* L. has rounded-oval eggs, 3 × 2·5 mm. in diameter, pure white, or yellowish-white, opaque, hard, and brittle. The eggs of *H. hortensis* Müll. agree in dimensions with those of *H. nemoralis* L., but are perfectly oval in shape, and the opaque-white and slightly glossy calcareous shell is thickly studded with microscopic rhomboidal crystals. When newly laid the eggs of *H. hortensis* Müll. are highly phosphorescent, and glow in the dark, but this gradually disappears as the shell thickens and becomes opaque. I have not noticed this phenomenon in *H. nemoralis* L. The eggs of *H. arbustorum* L. are laid in small clusters of thirty or more at the roots of plants. They are spherical in shape, semitransparent when deposited, eventually becoming opaque and yellowish. *Hygromia rufescens* (Auctt.) has pure white, globular eggs, 1·5 mm. in diameter. *H. hispida* (L.) lays from thirty to forty eggs; they are globose, opaque-white, 1 mm. in diameter. *Helix* (*Polydontes*) *imperator* Mont., from Cuba, has large, oblong, calcareous eggs measuring 12 × 8·5 mm. In the genus *Thelidomus*, e.g., *H. incerta* Fér. they are oval. I have eggs of *Auris distorta* Brug., from West Indies (ex Gibbons Collection); they are oval, white, with a faint tinge of pink, calcareous, and measure 6 × 5·5 mm. Gibbons describes the egg of *Buliminus mozambicensis* Pfr. as ovate-globular, white, with a thin calcareous shell, and rather more than 1 mm. in diameter.

Very large eggs are produced by the superbly coloured shells of the Ceylonese arboreal genus *Acavus*; two or three at a time. In *A. phœnix* Pfr. the egg is oblong-oval, dull white, measuring 20 × 15 mm.; that of *A. superbus* Pfr., elongate-oval, livid-white, 22 × 16 mm.; *A. hæmastoma* L., oblong-oval, shining white, smooth, 18 × 15 mm.; that of *A. waltoni* Rve., elongate-oval, bluish-white, 21 × 14 mm. In this group the egg is about one-third the diameter of the adult shell. The eggs are deposited in moist places under the mould around the roots of large trees. The country people know them well, and enjoy opening them to find the young snail inside, which even before hatching exhibits the varied and beautiful colours of the adult.

Hedley, in "Records of the Australian Museum," 1892, groups *Panda falconeri* Rve. and its allies, *Pedinogyra cunninghami* Gray, *Caryodes dufresni* Leach, *Anoglypta launcestonensis* Rve., with *Liparus inflatus* Rve. and its allies under the group *Macroön*, as representatives of the Australasian *Helices*, producing large, white, calcareous eggs. He gives very good reasons for this arrangement, directing attention to features of their eggs, embryonic shells, and anatomy not previously appreciated. The group as herein understood contains snails with helicoid or bulimoid shells, utterly dissimilar from a conchological point of view. The only egg I have seen belonging to this group is that of *Caryodes dufresni* Leach, from Tasmania, of which I have specimens from the "Beddome Collection." They are pure shining white, under a lens very finely granulate, regularly oval, 11 × 8 mm. The egg of *P. cunninghami* Gray is globose, white, hard, brittle, coarsely granular outside, smooth within, diameter 9 mm.

The eggs of *Stylodonta*, from the Seychelles, are large. Two, rarely three, lie in the oviduct one after another enveloped in a glairy mass, which is probably consumed by the young when the egg hatches. At birth, the young, after leaving the oviduct, pass by their own movements out between the body and the shell of the mother. Dufo describes this as the procedure in the case of *S. unidentata* Chem. I have two eggs of *S. studeriana* Fér., taken from a spirit specimen, which measure 15 × 12 mm.; they are oval and dull white in colour.

The egg of *Borus popelairianus* Nyst, from Ecuador, appears to be the largest known. It is elliptical, white, and measures 51 × 28 mm., the young on extrusion measuring 41 mm. *B. ovatus* Müll., from Brazil, has an egg as large as that of a thrush; that of *B. bronni* Pfr. measures 15 × 11 mm. *B. cantagallanus* Rang has a white cylindrical-ovate egg, measuring 14 × 9 mm. These large eggs are eagerly sought after by the negroes, who esteem them highly as a delicacy. This may be one reason why they are so seldom seen in collections. The egg of *B. oblongus* Müll., from Trinidad, is perhaps the best known; I have a large series, varying in size from 30 × 20 mm. to 19 × 17 mm. *B. rosaceus* King, from Chile, has oval eggs, 18 × 11 mm.; those of *B. capillaceus* Pfr., from the Amazon district, are pure white, oblong-oval, and measure 15 × 12 mm. A lengthy account of the composition and general character of the egg-shell in the genus *Borus* will be found in Malak. Blätter, xxv., p. 176.

The eggs of the New Caledonian *Placostylus porphyrostomus* Pfr. are elliptical, pure white, and measure 4 × 5 mm. They are always laid in damp situations, in hollowed-out cavities, and thickly covered with leaves. I have more than once been keenly disappointed through consignments of eggs of this species having hatched out during the voyage, owing to my correspondents having omitted to destroy their vitality before despatching. Suter states that the eggs of *P. bollonsi* Suter, from New Zealand, are very large, elongate-oval, rounded at both ends, calcareous, thin, white, finely granular, with a few larger granules irregularly interspersed, and measure 18 × 13 mm. *P. hongi* Suter has rather small eggs, measuring 5 × 6 mm.; they are white, roundly ovate, very thin shelled, finely granular, fragile, and lightly shining. This snail is usually found at the roots of *Phormium*, forming regular nests, eggs and young snails in the centre, and outside these there is generally a circle of dead shells.

In *Partula*, reproduction seems to be ovoviviparous. The upper part of the oviduct contains eggs with a calcareous shell, which, as they mature, become dissolved and consumed by the embryos. Pilsbry describes the egg of *P. bellula* Hart. as shortly-oval, matt-white, quite smooth under a lens, and measuring 3 × 2·5 mm. A specimen of *P. ganymedes* Pfr., from Society Islands, in my collection, contained an egg which is oblong-oval, white, and measures 3·5 × 2·5 mm.; and I have a set of eggs of the sinistral *P. canalis* Mss., from Upolu (ex Godeffroy Collection), which are white, elliptical, and measure 4·5 × 3·5 mm.

In the family *Achatinidæ* the number and variety of species is very great, and the variation in the eggs of such as are known is correspondingly so. The African species are classified, provisionally, by Pilsbry, under the principal groups *Achatina*, *Cochlitoma*, and *Archachatina*, but many are inadequately known anatomically, especially some of the commonest West and South African species. In *Achatina* the reproduction is oviparous, the eggs small, numerous, oval, calcareous, pale yellow, and the adult shells have a correspondingly small dome. Gibbons states that a specimen of *A. panthera* Fér., from Mozambique, whilst in his possession laid 196 eggs. Some eggs of this species which I have from the Gibbons Collection, are oval, mustard-yellow, thin shelled, 6 × 5·5 mm. Von Martens found dull, pale yellow eggs 6 × 5 mm. in *A. fulminatrix* Mts. from Tanganyika. *A. jacobi* Da Costa, from Salisbury, Rhodesia, has spherical, yellow eggs, 5 × 4 mm. diameter. *A. achatina* L. (= *A. variegata* Lam.) from West Africa, has oval eggs; a specimen I have is tawny in colour, and measures 8 × 6·5 mm., but the colour may be due to staining, as the egg was taken from the dried-up animal. I have eggs of *A. fulica* Fér., from Madagascar, which are dull yellowish-white, very elongate-oval, and measure 5 × 3·75 mm. In the sub-genus *Leptocala* the eggs differ in colour from those of *Achatina* in being dirty-white; those of *L. pulchella* Mts. measure 4 × 5 mm. In *Cochlitoma* the reproduction is ovoviviparous, the young shells at birth being considerably larger than those hatched from species of *Achatina* which have equally large shells when adult. Semper found sixty undeveloped eggs with calcareous shells in a specimen of the South African *C. zebra* Brug., the smallest 3 mm., the largest 6 mm. long, together with twenty-five embryos which had broken out of the egg-shell.

(To be concluded).

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ON THE CALCAREOUS EGGS OF TERRESTRIAL MOLLUSCA.

(Concluded from p. 160).

(Presidential Address delivered at the Annual Meeting, October 14th, 1916).

By ROBERT STANDEN,
Assistant-Keeper of the Manchester Museum.

C. granulata (Krauss) from Natal, has pale yellow, oval eggs, 9 × 7·5 mm.; those of *C. varicosa* Pfr., from the Cape, are elongate-oval, yellowish-white, and measure 15 × 10 mm.; *C. semidecussata* Pfr., from Natal, has oval, yellow eggs, 10 × 8 mm. *C. marginata* Sw. is said to deposit its eggs in the axils of branches of trees, but I have eggs from Fernando Po which are stated by their collector to have been deposited on the ground at the foot of trees. They are oblong-oval, yellowish-white, and measure 19 × 14·5 mm. The large egg, 25 × 17 mm., described and attributed to *A. achatina* L. by von Martens, probably belongs to *A. marginata* or some other large-domed species.

In *Archachatina*, the obtuse dome of the shell, caused by the great size of the protoconch developed in a very large egg, separates it at once from the small-domed *Achatina*, and it also differs from *Cochlitoma* in the more ample protoconch and oviparous reproduction. The largest eggs produced by any member of this family appear to be those of *A. bicarinata* Brug., from São Thomé. They are from three to five in number, varying in size from 14 × 20 mm. to 19 × 17 mm., are a beautiful citron-yellow in colour, and have a shell 3 mm. thick. *A. purpurea* (Gmelin) has very large yellowish-white eggs measuring 18 × 12·25 mm.

The eggs of *Homorus castanea* Mts., from East Africa, are elongate-ovate, and 5 mm. in length; those of *H. pileatus* Mts., according to d'Ailly, are nearly spherical, 2 mm. in diameter; a specimen of *H. manboiensis* (Smith) examined by Smith contained an egg, 5 mm. in length, elongate-ovate in shape. In the West African *Pseudoglessula* the eggs are markedly oblong, and lie obliquely in the oviduct. *P. retifera* Mts., from Cameroon, has pale yellowish, white eggs, 4 × 2·75 mm.; in *P. sjostedti* d'Ailly, they are pure white, 6 × 3 mm.; while in *P. humicola* Dup. and Putz., from the Congo, they are white and sub-spherical, and as they differ greatly from those of typical species of the genus, probably belong elsewhere. The eggs of *Rumina decollata* (L.) are globular, white, and about 2·5 mm. in diameter.

Limicolaria numidica Rve., from West Africa, has pale yellow eggs measuring 4·5 × 3·5 mm., twenty-two were contained in one specimen examined; those of *L. praetexta* Mts. are 1·8 × 1·4 mm.; and in the solitary specimen obtained of *L. saturata* Smith the remains of the animal enclosed twenty ovate, white, strong-shelled calcareous eggs, 6·5 × 5 mm. An egg of *Oxystyla undata* Brug., from Florida, in my collection, taken from the body of a dried specimen, is globular, whitish, and 6 × 5 mm. diameter. *Porphyrobaphe fungairinoi* Hid., from Ecuador, has elongate-oval, white eggs, 7 × 5 mm.

A specimen of *Callistopepla barriana* Sow., from Cameroon, opened by d'Ailly, contained fourteen elliptical eggs with chalky-white, granulate, calcareous shells, measuring 7 × 6·5 mm. The West African genus *Pseudotrochus* is ovoviviparous. Rang found in an individual of *P. alabaster* (Rang) fourteen whitish, oblong eggs, and ten young shells; and d'Ailly took from a specimen of *P. solimanus* (Morelet) fourteen eggs of a polished and glossy whiteness, measuring 5 × 3·75 mm. *Perideris auripigmentum* Reeve, from Guinea, has white, oval eggs, 5·5 × 4·5 mm.

In *Subulina* the eggs are calcareous and sub-globular. The well-known *S. octona* Brug. is remarkable for the great development of the female organs, which suggest that those of the female precede the male in functional activity. Immature shells of 6 mm. in length contain from four to five white eggs, 2 to 2·75 mm. in diameter, plainly visible through the thin shell, with embryo shells in the anterior whorls. *S. tortistriata* Pils., from Senegambia, has yellowish spheroidal eggs. *Prosopeas tchehelense* de Morgan has exceedingly large eggs for the size of the animal. In *Euonyma platyacme* M. and P., from Pondoland, the eggs are globular, white, 3 mm. in diameter, and show plainly through the semitransparent shell. *Curvella delicata* (Taylor), from Zanzibar, has been found to contain three or four large calcareous eggs. *C. crosbyi* Burnup, from Zululand, has nearly spherical, white, hard-shelled eggs, 1·3 mm. in diameter. Specimens of *Pseudopeas eugens* (d'Ailly), from Cameroon, contained perfectly spherical white eggs, arranged in a single series in the oviduct, visible through the shell. In *Glessula singhurensis* Blanford and in *G. cassiaca* Bens., from the Naga Hills, India, Blanford found small, round calcareous eggs, and concludes that this genus is ovoviviparous. *Obeliscus sylvaticus* Spix, from Cayenne, has a round, white egg, 2 mm. in diameter. Von Martens found in a specimen of *Leptinaria striosa*

(C. B. Ads.), from Santa Clara, six calcareous, white, globular eggs, 1·7 to 1·8 mm. in diameter. The eggs of *Cryptelasmus canteroiana* Gund., from Trinidad, are calcareous, very much flattened and 1·25 mm. in greatest diameter. Those of *Spiraxis simplex* Guppy, from Trinidad, are white, calcareous, and closely resemble those of *Subulina.*

The eggs of *Eucalodium* are elliptical, the shell hard, white, rough to the touch, and showing crystalline facets under a lens. They are comparatively large, that of *E. decollatum* (Nyst) measuring 11·2 × 7·2 mm. *E. mexicanum* Pfr. is said by Crosse and Fischer to have a similar egg, but that of *E. walpoleanum* Crosse and Fischer (belonging to the sub-genus *Oligostylus*) is smaller and narrower, 7 × 4 mm. *Coelocentrum gigas* Mts. has a short oval egg, 3·5 × 2·5mm. It is roughened by numerous white polished crystalline facets, which give it the appearance of being frosted over, and is a strikingly beautiful microscopic object. A. A. Hinkley writes to G. C. Spence that he found this species on the mountain-sides, west of Livingston, Guatemala, in thick timber. The eggs are deposited under dead leaves, in small depressions made by the snail in the soft mould. The place selected is always a little open, so that the sun may shine thereon for a short time during the day. Very little seems to be known of the reproduction in other Urocoptid genera. G. C. Spence has recorded the finding of white calcareous eggs inside the shells of several species, which are presumably ovoviviparous. In *Anoma solida* (C. B. Ads.) the egg is long-oval, 1 × 1·5 mm.; in *Urocoptis lavalleana* d'Orb., round, diameter 1 mm.; in *U. intusmalleata* Gund., round, diameter ·9 mm.; and in *Microceramus mexicanus* Pfr., round, diameter ·75 mm. (vide *Journ. of Conch.*, vol. 15, p. 12).

That such fragile objects as the calcareous eggs of snails should be found fossil seems surprising, yet they occurred in considerable numbers in Pleistocene deposits in a cave at Dog Holes, on Warton Crag, near Lancaster, which was excavated by J. Wilfrid Jackson in 1907–9. They were associated with an immense number of land mollusca, mainly minute species. They were also found by W. J. Lewis Abbott in the Ightham Fissures, Kent, in a deposit of similar age and character. The eggs apparently belong to several species of *Helix* and *Hyalinia.* As the eggs of snails are known to be attacked by minute *Diptera*, which pierce and lay their eggs in them, it is not unlikely that the small, regularly drilled hole present in many of the fossil eggs may have originated in similar attacks by this class of insects. In writing of a series of the fossil *Chilonopsis nonpareil* (Perry), collected by Colonel Turton at Sugarloaf Mountain, St. Helena, E. A. Smith remarks that some fossil snails' eggs obtained with the shells evidently from their size belong to them; they are roundly-ovate, and measure

6 × 5 mm. Some other smaller eggs were also obtained with them, at the same place, but it would be guesswork to suggest to what species these belong.

Considering how interesting the eggs of snails always prove to those unfamiliar with them, it seems strange that they should be so seldom seen in collections, though of late years the large and conspicuous eggs of *Borus oblongus* Müll. have become fairly common, and are usually regarded as a curiosity. I have often been amused, when showing my eggs to non-conchological friends, to note their amazement, and often ill-repressed incredulity, when told that these were really snails' eggs and not those of birds, though some of them were large enough to be "blown," like birds eggs, with drill and blow-pipe. Personally, my own snails' egg collecting has practically been confined to our own British species, which, though small, are fully as interesting in their way as the foreign ones, which I have had no opportunity of seeking in their native habitats.

The examination of dried-up bodies of exotic snails, or such as have been preserved in spirit, has proved one of the most prolific methods of obtaining eggs, more especially in turreted or many-whorled species, where by reason of careless cleaning a portion of the body, including the oviduct, has been left behind and allowed to dry up. Many of my specimens have been obtained in this way, and it is noteworthy that many of the species of eggs placed upon record by various observers have been obtained from a similar source. My friend, G. C. Spence, has been particularly fortunate in thus obtaining examples of several hitherto unknown eggs, and I am indebted to him for some valuable additions to my collection.

It may perhaps be considered that my address deals with a minor detail of trivial importance, but no detail is trivial if likely to contribute ever so small an item to our knowledge of any given subject.

In my remarks I have embodied particulars and measurements which represent practically the sum total of our present knowledge of the subject, and of these many are from my own specimens, some of which have not hitherto been recorded. For others I am chiefly indebted to Tryon and Pilsbry's "Manual of Conchology." The study of the molluscan egg in its many and diversified forms of reproduction and development, especially when co-ordinated with that of the nepionic whorls, which so frequently differ widely in sculpture and other characters from those of the adult shell, offers a wide field for investigation and research, and their associated value as an aid to classification must eventually become more fully recognised.

ON THE SUPPOSED OCCURRENCE OF JAMINIA TRIPLICATA Studer IN SUFFOLK.

By J. DAVY DEAN AND J. R. LE B. TOMLIN, M.A.

(Read before the Society, June 7th, 1916).

IN 1906 the late Dr. Chaster introduced[1] *Jaminia triplicata* Studer as "a new British terrestrial mollusc" on the strength of specimens which he had collected at Brandon in Suffolk. The record was received with a certain amount of doubt at the time and has never, so far as we know, been subsequently confirmed.

Through the kindness of Dr. W. Evans Hoyle, the Director of the National Museum of Wales (which institution now possesses the Chaster Collection of Shells), we have been able to examine and compare the original specimens on which Dr. Chaster based his record with examples in our own private collections. We have also received further examples, indistinguishable from this series, from the original locality, through the kindness of Mr. Mayfield, of Mendlesham, who also informs us that it was to this form he referred in his note on "Two and three-denticled forms of *Jaminia muscorum* L."[2]

Messrs. Kennard and Woodward in their[3] "List of British Non-Marine Mollusca" (1914) refer the Brandon specimens to *P. muscorum* var. *glis* Westerlund,[4] and remark :—"The British examples referred to *P. triplicata* we consider varietal examples of *P. muscorum*."

There is thus in the identification the element of doubt, but before giving, what seems to us, a correct analysis of the subject, we feel we cannot do less than pay a ready tribute to Dr. Chaster's generally accurate determinations.

What strikes one at once is the absurdity of calling the Brandon shells "remarkably small *Jaminiæ*." In our experience any batch of *J. muscorum* will show considerable variation in size, and we find the so-called *triplicata* entirely comparable in these extremes of measurement with series of *J. muscorum* from—for instance—the Channel Isles, the Berkshire downs, the Isle of Man, Sweden and the United States.

The Brandon shells are, generally speaking, lighter in colour than typical *muscorum*—a point which Dr. Chaster, curiously enough, does not mention. This lighter colour is consistent with a more solid shell and tooth development is correlative. Some are bidentate, while others have in addition a deep-seated callosity on the columella, difficult to see from any point of view.

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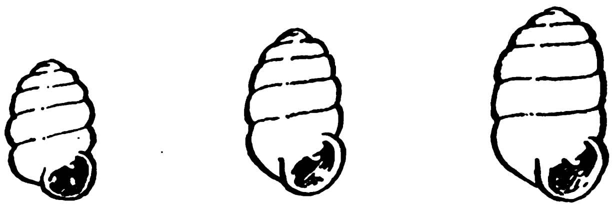
[1] *J. of Conch.*, vol. xi., p. 319.

[2] *J. of Conch.*, vol. xii., p. 317.

[3] Taylor and Francis, Red Lion Court, Fleet Street, E.C.

[4] Nachrichtsblatt, 1893 (Jul.-Aug.), p. 120, Yorkshire (J. Ponsonby).



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J. triplicata Stud. Botzen, Tyrol. *J.* "*triplicata*." Brandon, Suffolk. *J. muscorum* L. Birkdale, Lancs.

Spp. from the Chaster Collection in the National Museum of Wales, Cardiff.

The three figures are all drawn from specimens in the Chaster Collection at Cardiff. It will be seen from these that the last-whorl characteristics in *triplicata* are, quite apart from the question of teeth, of a distinctive nature. *J. triplicata* has a smaller and more oval shell, deeper sutures, a proportionally smaller and more quadrangular aperture, more convex whorls, teeth stronger and of a distinctly calcareous nature as opposed to the thin horny shell, and the exterior rib of the aperture much less white and further from the margin.

Anyone who is acquainted with this family knows that too much reliance must not be placed on dentition. To show how inconstant a character the tridentation is in *J. triplicata*, we may mention that Westerlund has described var. *edentula*, var. *unidentata* and var. *bidentata* all from the South Tyrol; the var. *striatissa* Gredler and the var. *inops* Reinhardt are both bidentate forms, while the var. *luxurians* Reinhardt has an extra palatal tooth. One of us has a French example, ex coll. Crosse, with two strong parietals, one columellar tooth, two palatals and one labial.

Dr. Chaster emphasized (l.c., p. 320) a distinction between *J. muscorum* and his *J. triplicata* in the character of the parietal tooth. The examination of his Brandon specimens shows that in some this tooth has only the form of a "short ridge" or lamella, and in others, that of a "minute rounded elevation." There cannot be any doubt that this identification in 1906 was erroneous. The Brandon shells are, in fact, a slightly variant race of *J. muscorum*, probably peculiar to the chalk warrens of Norfolk and Suffolk. We should, therefore, doubt the reference to var. *glis* West., which was described from Yorkshire examples. Unfortunately all trace of the type of this var. seems lost. Mr. Ponsonby had no recollection as to what became of it.

Rossmässler's *Pupa bigranata* seems to be somewhat uncertain, though personally we think that Jeffreys was correct in taking it to be the bidentate form of *muscorum*. It may be well to point out, however, that the latter author, when he speaks of the denticle on the columella, in describing the var. *bigranata*, means the parietal tooth.[1] Fortunately we may in any case discard Rossmässler's name, as reference to Draparnaud's[2] original description of his *Pupa marginata* shows that it refers to the bidentate form of *muscorum*, which may therefore figure for the future on our list as var. *marginata* Draparnaud.

We use in this paper the generic name *Jaminia* for convenience, as being the name used by Dr. Chaster.

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Notes on some Shell Beaches and rare Cornish Marine Shells.—*Mangilia rugulosa* Ph.—I found three specimens of this shell in a small cove on the right bank of the river and close to the mouth, near Padstow, in August, 1910. This locality agrees with that given in Tregelles' List, viz., the parish of St. Merryn, on the authority of the late W. V. Tellum. Mr. W. Hockin found it here in 1865, this being the first record for the British Isles. *Mangilia nebula* var. *vittata* Norm. = *Mangilia lævigata* Jeff.—This very rare shell, according to Dr. G. F. Tregelles' Lists, has been found at Scilly on a few occasions, but not on the mainland. I procured a single specimen at Sennen Cove in April, 1910. *Mangilia nebula* var. *lævigata* Ph. (= *M. lævigata* var. *minor* Jeff.) is far more common than the above. I have found it at Falmouth, Sennen, Porthcurnow Cove, and near Padstow. *Mactra glauca* Born.—Mr. J. W. Girdleston, of Carbis Bay, near St. Ives, kindly allowed me to inspect several fine specimens of this rare shell, picked up by him at Carbis Bay, Lelant, and Hayle. He told me that he used to find large numbers of this species. *Divaricella commutata* Ph.—This shell also, Mr. Girdleston informed me, used to occur in considerable quantities with *Mactra glauca*. He kindly gave me two valves. It is interesting to note that these two species are no longer found at the places mentioned, and not only so, but there has been a general falling off in numbers of all species found at St. Ives Bay. Mr. Girdleston, living on the spot, informed me that there was not now a hundredth-part of the shells that there used to be. This was my experience also, during the four periods (one extending over six weeks) in which I had these beaches under observation. As a result of six years' close observation I am forced to the conclusion that a similar diminution in the number of shells cast up has taken place in nearly every part of Cornwall. This is certainly the case at Falmouth. I have data in the case of particular species which would prove this. For example, in six years I found only one example of *Aporrhais pes-pelecani* at Falmouth. This used to be common there. Any explanation of these facts would, I think, be of very great interest. Dredging operations at Falmouth, Helford, and St. Ives have caused me to conclude that this diminution is not confined to shells cast up.—ALAN GARDINER. (*Read before the Society*, Dec. 8th, 1915).

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[1] *Brit. Conch.*, vol. i., p. 250.

[2] Hist. Nat. des Moll. Terr. et Fluv. de la France (1805), p. 61.

ADDITIONS TO "BRITISH CONCHOLOGY."

BY J. T. MARSHALL.

PART VII. *(continued from p. 89).*

Jeffreys' and Sowerby's figures of *C. glabrum* and *C. trachea* are depicted as of the same size, though the latter is six times the bulk of the former. Searles Wood's Crag figures exhibit them in truer proportion.

Truncatella truncatula Drap.—The record of this species from Caldy Island[1] was an error. But as *Assiminea littorina* has now been found on that island by Mr. Williams-Vaughan, *Truncatella* may also be looked for, as the two are usually associated on our coasts.

Scalaria Lam.—The use of this generic name is a stumbling-block to all systematists. *Epitonium* Bolt. appears to be the most legitimate, and should be used on the ground of priority. Even Prof. W. H. Dall, usually so rigid in the matter of priority, finds it an awkward nut to crack. See his article in Bull. Mus. Comp. Zool., vol. xviii., p. 299.

S. turtonæ Turt.—Off Loch Ryan, 27f.

A specimen which had incurred some injury when half-grown proceeded to finish its abode with double the number of ribs, these being flexuous and placed at a contrary angle to those preceding.

S. communis Lam.—This species is "*Turbo clathrus* L. of the Fauna Suecica, and also of the tenth and preceding editions of his Systema Naturæ. Petit in consequence named it *S. clathrus*, which is more correct than *communis* according to the recognised laws of nomenclature."[2] In Linné's later edition, however, (12th) his *Turbo clathrus* "is described as having the base encircled by a spiral keel or ridge, and is consequently not the British species."[3]

S. trevelyana Leach.—Off Fair Isle (Simpson)! Also Atlantic off Scilly 690f., and off the Portugal coast 1095f. ('Porcupine')!

S. clathratula Ad.—An abnormally large specimen of this shell has been recorded by Mr. Bartlet Span from Laugharne.[4] It is an inch in length, but, as usual in this species, is minus the embryonic whorls. An unusual episode attaches to this *Scalaria*. It was sent me by Mr. Span for verification, and duly returned with other shells, but it never reached his hands, and we ultimately gave it up as lost. A long time afterwards a Tenby postman was detected in dishonesty, and on being convicted and sentenced to two years' imprisonment, he acknowledged stealing various packets, the contents of which, he said, would be found at the top of an old cupboard in his home, and on a detective making a search he discovered and rescued, from a miscellaneous assortment of stolen property, this record example of *S. clathratula*.

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[1] Span: *Journ. of Conch.*, 1899, vol. ix., p. 209.

[2] Jeffreys: Moll. 'Lightning' and 'Porcupine,' Proc. Zool. Soc., 1884, p. 137

[3] Jeffreys: Brit. Conch., vol. iv., p. 93.

[4] *Journ. of Conch.*, 1899, vol. ix., p. 209.

A specimen of *S. tortilis* Wats. has been dredged by the Irish Fishery Board in the Atlantic off Ireland, in 624–728f., and three specimens of *S. richardi* Dautz. and de Boury in the same district in 325–660f.

Cioniscus unicus Mont.—Alderney (Marquand)! Lewis in the Outer Hebrides (Simpson)! off Loch Ryan 25–28f., Kilbrannan Sound 25f.

Aclis ascaris Turt.—Off Loch Ryan 27f.

A. supranitida S. Wood.—Alderney (Marquand)! off Loch Ryan 25f.

A. walleri Jeff.—The animal of *A. walleri* was described by Gwyn Jeffreys in the Appendix to his fifth volume (p. 210). In a foot-note on the same page he wrote that "perhaps this specific name ought classically to be *valleri*," but this suggestion has not commended itself to any subsequent writer.

var. **exigua** G. O. Sars=var. *minor* Jeff.—South-West Ireland 38–79f. (R.I.A. cruise). In a previous note I was mistaken in referring this to var. *minor* Jeff., in consequence of the latter author ambiguously citing var. *exigua* as a synonym of his var. *minor* in the 'Lightning' Report; but as a matter of fact Jeffreys' var. *minor* is a dwarf form of five or six whorls, while Sars' var. *exigua* is a slender form of eight whorls.

Pherusina Norman = *Pherusa* Jeffreys.—Canon Norman writes me that in substituting *Pherusina* for *Pherusa* it had nothing to do with *Phædusa* Ad., and cites more than sufficient reasons for changing the name, thus:—

Pherusa Rafinesque	Mollusca, 1815.
Pherusa Leach	Crustacea, 1815.
Pherusa Oken	Vermes, 1815.
Pherusa Lamarck	Polyps, 1816.
Pherusa Koch	Crustacea, 1834.

In a paper on the Mollusca of St. Malo,[1] by MM. Dautzenberg and Durouchoux, the authors proposed the generic name *Marteliella* for *Pherusa* Clark, apparently overlooking the fact that Canon Norman long ago emended the name to *Pherusina*,[2] which, as pointed out by Mr. Tomlin,[3] has been published in this *Journal* in a list of British mollusca, thus rendering *Martelliella* superfluous.

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[1] Feuille Jeunes Nat., 1913.

[2] Mus. Norm., 1888, part iv., p. 18.

[3] *Journ. of Conch.*, 1915, vol. 14, p. 287.

There has always been a difficulty in allocating this shell to a satisfactory position, its place in *Aclis* being only provisional. When Clark discovered it he called it *Pherusa*, but he actually described it as a *Chemnitzia*,[1] and it has appeared under various other names.

P. gulsonæ Clark.—Berehaven 5f., and Dursey Island 25f. (R.I.A. cruise); Mull of Cantire 20f. Also Adventure Bank 92f. ('Porcupine')! and from the same locality in 120f., with var. *cincta* Marsh. ('Shearwater').

Odostomia minima Jeff.—Off Loch Ryan 25f. Not Alderney, recorded in error by Mr. Marquand in mistake for *Jeffreysia diaphana*. Also off the Tripoli coast 40-120f., and Adventure Bank 120f. ('Shearwater')! and in the latter district in 92f. ('Porcupine')!

The Marquis di Monterosato eliminates this species from the *Odostomiæ*, and combines it with *Jeffreysia cylindrica* under a new genus or sub-genus of *Aclis*, for which he adopts the name *Cima*. *Jeffreysia cylindrica* has certainly some affinity with *O. minima* on the one hand, and with *O. nitidissima* on the other. It resembles the the former species in the texture of the shell and in the peculiar flexuous microscopic longitudinal striæ, while in outward appearance it more closely resembles the immature stage of *O. nitidissima*.

Although *Jeffreysia cylindrica* was discovered many years ago at Spezia, in 12 fathoms, it remains rare. I can record it, however, from the Tripoli coast in 120f., Adventure Bank 92f., and at some distance off the latter district in 120f.

O. nivosa Mont.—Alderney (Marquand)!

O. truncatula Jeff.—The name of *Jordaniella* has been conferred on this shell as a brand-new genus. It is not differentiated in any way, but its author simply imposes the name, because, he says, "Mr. Jordan's name is appropriately associated with *O. truncatula*, he being the first to recognise its peculiarities,"[2] a rather slender claim for creating a "new genus" at this time of day, even if it were true, which it is not. The truth is that *O. truncatula* was first discovered and made known by the three gentlemen whom I have named,[3] and while Gwyn Jeffreys subsequently described it in 1850, and Forbes and Hanley in 1852, yet neither of these *six* gentlemen were aware of "Mr. Jordan's name being associated with it," appropriately or otherwise, which is not surprising when it is remembered that Mr. Jordan was a boy at school at the time.

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[1] Ann. Mag. N. Hist., vol. vi., p. 459, ser. 3.

[2] Proc. R.I. Acad., 1898, vol. v., p. 21.

[3] *Journ. of Conch.*, 1899, vol. 9, p. 224.

Having subsequently found the name of *Jordaniella* preoccupied, the author substituted *Jordanula* in its place,[1] but still without giving any definition of what he meant by it, so that before this so-called new genus can have any scientific existence it will be necessary to define it if possible.

O. clavula Lov.—S.W. Ireland (R.I.A. cruise); off Loch Ryan 25f., Mull of Cantire 24f., and Kilbrannan Sound 25f. A rare species, but in the south-west of Ireland and in the Sound of Sleat it is comparatively plentiful.

O. lukisi Jeff.—Alderney (Marquand)! Connemara; off Loch Ryan 27f., Benbecula Sound 10f., and West Orkneys 45f. Also Algerian coast 112f. ('Porcupine')! Gwyn Jeffreys' original figures of this shell in the "Annals" are unreliable.

O. albella var. **subcylindrica** Marsh.—Caldy Island.

O. rissoïdes var. **alba** Jeff.—Off Loch Ryan 25f.
var. **nitida** Ald.—Tenby.
var. **glabrata** F. & H.—Torbay, Tenby, and Killala Bay.
var. **exilis** Jeff.—Caldy Island.

The *O. pithus* of Tomlin and Shackleford, from St. Thomé, West coast of Africa, appears to be very closely allied to *O. rissoïdes*. I have not seen the shell itself, but from the description of the authors and the very excellent figure[2] I should have been inclined to include it under *O. rissoïdes* but for its widely different geographical source.

O. pallida var. **notata** Jeff.—This variety was founded on a solitary specimen obtained at Lerwick in the Shetlands, but I do not consider it tenable. I have various specimens of *O. pallida* with "convex whorls," as well as some from Lerwick itself which are "convex" and narrow, but in none of them are the spiral striæ "more conspicuous."

O. umbilicaris Malm.—6 to 60 fathoms. Clyde mouth (Simpson)! off Loch Ryan 20f. and 28f. (less rare than elsewhere); Mull of Cantire 27f., Lismore 6–10f., Oban 25f., the Minch 50f., Dornoch Frith, and Scalloway in W. Shetlands 12f. Those from the Minch are much larger than usual (13 lines by 6), and one of them is finely striated spirally.

var. **elongata** Jeff.—Torbay, off Loch Ryan 20–28f., Ailsa Craig 27f., Kilbrannan Sound 20–30f., off Arran 60f., Loch Fyne 20f., Loch Inver 25f. Those from Ailsa Craig belong to a dwarf form of this variety, as well as one from Torbay and one from Gairloch.

The apex in this species is nearly always horizontally exposed, as in *O. acuta*. Collectors will experience some difficulty in separating this from a form of *O. acuta* which has a shorter spire, convex whorls, and narrower base; the latter is identical in contour, but more solid and not so glossy. Jeffreys' figures are too conical and the whorls too convex (the shell is always more oblong), while Sowerby's is an exaggerated copy of this, and I have already noted their too conspicuous tooth and umbilicus.

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[1] *Journ. of Conch.*, 1901, vol. 10, p. 8.

[2] *Journ. of Conch.*, 1915, vol. 14, p. 308, pl. 5, fig. 4.

O. acuta var. **gracilis** Marsh. is the *O. acutula* of Monterosato.

O. conspicua Ald.—Alderney (Marquand)! Falmouth 19f., a slender variety; off Loch Ryan 25f., off Ailsa Craig 75f., Mull of Cantire 25f., Dornoch Frith, a slender variety. This is less rare at Scilly than elsewhere, but they are much smaller and more slender, and not easily separable from *O. unidentata.*

O. turrita var. **striolata** Ald.—Alderney (Marquand)! Caldy Island.

var. **nana** Marsh.—Off Loch Ryan 25f.

O. plicata Mont.—Alderney (Marquand)! All the records from the Clyde are unreliable.

var. **carinata** Marsh.—Torbay, one specimen only, but remarkable in having two carinations round the periphery.

O. insculpta var. **lævissima** G. O. Sars.—Lismore 6f., Glenelg 30–90f., Loch Inver 25f., Scalloway 12f.

var. **tumida** Jeff.—Off Arran 65f., Scalloway in W. Shetlands 12f.

O. diaphana Jeff.—Off Fair Isle (Simpson)! Shetland–Faroe Channel. After a careful comparison, I ascribe to this species the *O. dilucida* of Monterosato.

O. warreni Thomps.—Alderney (Marquand)! Achil Island; Benbecula Sound 10f. Also south of Syracuse 40f. ('Newport')! Vigo Bay 20f. ('Porcupine')! Tripoli coast 40–120f. ('Shearwater')!

var. **intermedia** Marsh.—Tenby and Caldy Island.

The type-form occurs in the Minch and Shetlands with var. *zetlandica* Marsh. I consider *O. scandens* (Brugno. MS.) Monts. to be this species, as also *O. exilissima* Brus. = *O. semiornata* De Fol.

O. obliqua Ald.—Not "Alderney (Marquand)," which was an error for *O. warreni.* Also Adventure Bank 120f. ('Shearwater')! and 92f. ('Porcupine')!

O. dolioliformis Jeff.—Great Yarmouth (Beckett); Caldy Island.

O. clathrata Jeff.—Straits of Korea 20f. ('Sylvia')!

O. indistincta Mont.—This species has not hitherto been recorded from any of the Channel Islands, except by Jeffreys, who cites "Guernsey." I have never met with it, and it is not to be found in the Jersey or Guernsey Museums, nor in the Lukis collection; neither do Mr. Duprey or Mr. Marquand enumerate it in their lists, so that Jeffreys' record emphatically requires confirmation.

O. interstincta Mont.—Straits of Korea 41f. and 54f., at the latter depth associated with the var. *suturalis* (H.M.S. 'Sylvia')!

var. **moulinsiana** Fisch.—Tenby.

Montagu's original figure of *O. interstincta* is a poor one of a nondescript form, and was probably taken from a specimen of the var. *intermixta* Monts.

O. spiralis var. **coarctata** Marsh.—Freshwater West. By some errors of punctuation on the part of the printer, my previous note on this variety became unintelligible.[1] It should read—"Found very sparingly with the type, but is most prevalent at the mouth of the Clyde; and off the Mull of Cantire, in 60 fathoms, all the specimens belong to this variety."

O. eximia Jeff.—I detected half-a-dozen specimens of this very rare little shell in some material received from Mr. Simpson, which had been trawled off the Flugga Light, at the northern extremity of the Shetlands. Its record from the Clyde arose from an error.

O. fenestrata Forb.—Teignmouth.

O. scalaris var. **rufescens** F. & H.—Off Loch Ryan 20f.

O. lactea L.—Benbecula Sound 10f.

O. innovata Monts.—Alderney (Marquand)!

O. verticalis Marsh.—A figure published of this species[2] is a photo only, and does not convey more than the general aspect and form of the shell; as such it cannot be differentiated from its congeners.

O. multilirata Monts.[3]—This is well figured from a photographic point of view, but not suitably for scientific purposes, the characteristic sculpture and the embryo not being made comparable with its congeners.

O. delicata Monts.—Another figure of this shell has also been published,[4] but it cannot be commended except as a photo. It is a coarser specimen than usual, and not quite mature, the aperture not being formed; but it is the only figure I know which exhibits the "ribs exquisitely dentellated at the suture," a character pointed out by Monterosato.

Finding some difficulty in determining the identity of *O. lactoïdes*, *O. innovata*, *O. pusilla*, and *O. delicata*, a writer thinks to simplify matters by pronouncing them one species, with the added warning that any attempt to separate them as distinct is "unscientific and misleading."[1] Very similar reasoning is given in the same paper for uniting *Siphonodentalium affine* with *S. lofotense*, because, the writer says, it is "quite impossible to separate the specimens when dealing with them in hundreds" (p. 25). It is quite true that when large numbers of the *Turbonilla* section of *Odostomia* are mixed together they make a confusing group to the uninitiated, and that the living specimens have a provoking way of assuming a different aspect to the dead ones, but the difficulty cannot be overcome by lumping them together in a hurry and calling their separation "unscientific and misleading," whatever that may mean. The only advantage to be claimed for this method is that it saves investigation and the trouble of thinking. This species, at any rate, has been described for more than half-a-century (1844), and its specific identity has received due recognition from all competent authors. *O. innovata* and *O. pusilla* are equally firmly established.

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[1] *Journ. of Conch.*, 1900, vol. 9, p. 295.

[2] *Journ. of Conch.*, 1912, pl. 5, fig. 8.

[3] Ibid., fig. 7.

[4] Ibid., fig. 6.

O. scillæ Scacc.—Off Loch Ryan 27f.

O. compactilis Jeff.—My recorded Scillonian specimens (two) may be open to some doubt. They are not altogether identical with Atlantic specimens, neither can I connect them with their nearest congener, *O. acicula*. *O. compactilis* occupies a middle place between *O. acicula* and *O. scillæ*, and is a somewhat critical species.

Ianthina rotundata Leach.—It is somewhat remarkable that the *Ianthinæ* do not visit the Channel Islands. They occasionally reach the Scilly Islands and the Land's End, but I have known only one instance of their occurrence in the Channel Isles, and that was in St. Clement's Bay, Jersey, where a considerable fleet was washed ashore in mid-winter, 1916, in contrast to their usual arrival on our coasts during the summer months. The local paper announcing their arrival said "the sea was black with millions of small fish similar to a *nautilus*, but very much smaller," though this was an exaggeration, the gale certainly washing ashore a considerable mass of flotsam, seaweeds with their *Aplysia* inhabitants, and a large number of *Ianthinæ*.

Stilifer turtoni Brod.—The shells of this species when fresh caught are amber-coloured, but soon fade into pellucid-white. I have already written that there are two distinct forms of the shell.[2] That the two forms are sexual I think is evident from the fact that they are always present together in every colony of *Stilifer* that I have examined.

(To be continued).

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[1] *Proc. R. I. Acad.*, 1898, vol. v., p. 23.

[2] *Journ. of Conch.*, 1900, vol. 9, p. 338.

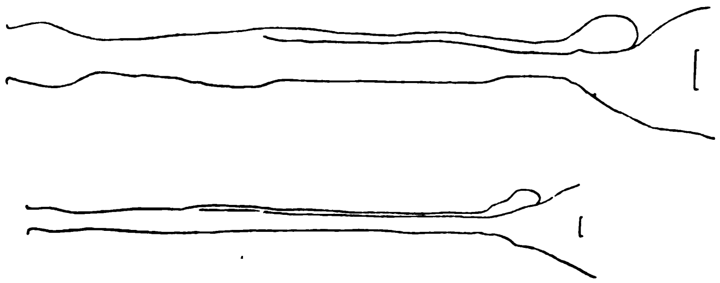
PRELIMINARY NOTE ON THE GENITALIA OF ACANTHINULA LAMELLATA Jeff.

By A. E. BOYCOTT.

(Read before the Society, December 8th, 1915).

SOME time since Mr. J. W. Taylor drew my attention to the fact that the anatomy and relationships of *A. lamellata* were obscure and suggested that further investigation was desirable. With his help and through the great kindness of Messrs. J. A. Hargreaves and R. A. Phillips I have had a pretty free supply of material which has yielded such curious results that I desire to bring them before the Society for consideration without feeling altogether confident that they represent the whole truth about the genitalia of *lamellata*.

The specimens examined have been derived from three lots collected in Yedmandale, near Scarborough, by Mr. Hargreaves, and from a batch taken at Abbeyleix, Queen's County, by Mr. Phillips. Gross dissection, with needles, under the microscope proving useless in my clumsy hands, the enquiry has been based on the examination of serial microscopical sections of the animals fixed in a more or less extended position after the shell had been chipped off. Such sections consist rather largely of pieces of small tubes, often without any local connections to hold them in position. The possibility of these bits falling out of the sections has been controlled by the examination of specimens cut in situ in the decalcified shell and by using a most convenient method of double embedding in clove-oil-celloidin and paraffin communicated to me by Mr. A. Bacot, F.E.S.



The genitalia so shown prove to be of a singularly simple form. There is the usual hermaphrodite gland; from this leads a well-formed hermaphrodite duct which on reaching the albumen gland is bent on itself. There succeeds a simple form of oviduct, with many mucous cells in the wall but without the voluminous glandular mantle commonly present in Helicids. Towards the lower end of this glandular oviduct, a prostate (the name is exceptionally inappropriate) is found with the usual granular cells, opening into the oviduct by a narrow channel. The walls of the oviduct then become simpler and it is continued as the free oviduct, lined with plain epithelium and with a moderate muscular investment, to the external opening on the right side of the neck. About half-way along this free oviduct opens a narrow duct which runs upward in apposition with the oviduct till it ends in an ovoid spermatheca lying at the junction of the free and glandular portions of the oviduct. The parts from the lower end of the glandular oviduct downwards in two specimens are shown diagrammatically in the figure as reconstructed from the sections; the magnification line in each case represents 0·1 mm.

There appears to be no specialised male apparatus. The findings described have been unambiguous, uniform and consistent in all the twenty specimens examined. In none of them has anything like a vas deferens or penis been found, nor any structure which could not be identified as something other than male genitalia. The glandular oviduct shows a certain amount of folding of the walls, but there is no specialised part nor any area of ciliated epithelium such as are commonly believed to be associated with the passage of spermatozoa. The so-called prostate is, of course, not an exclusively male appendage.

The absence of a male genital duct cannot be accepted without some hesitation and it is naturally difficult to be convinced of such a negative conclusion. There are several possible sources of error. *(a)* It being conceivable, though scarcely likely, that the results were due to the method employed, other small species were examined by the same process. In *Pupa umbilicata*, *Vallonia pulchella excentrica*, *Pyrmidula rupestris* and in some specimens of *Acanthinula aculeata* there is no difficulty in seeing that there is something else present besides the large and obvious oviduct and spermatheca, and the method admirably displays the anatomy of the larger species such as *Hyalinia pura*, *radiatula*, *fulva* and *crystallina*. Of *Punctum pygmæum* and *Carychium minimum* I can at present make out but little; the organs are fearfully small. *(b)* The possibility that *lamellata* is diœcious is disposed of by the fact that in all the specimens in which the sections were carried far enough (*i.e.* in fourteen examples) both ova and spermatozoa were found in the hermaphrodite gland. *(c)* I have no evidence of the maturity of the specimens except the size of the shells, and as there is no formation of a peristome or rib no other criterion seems available.[1] The specimens examined were taken from among the largest of each batch, and the diameter of the shells was between 2·0 and 2·5 mm., mostly about 2·2 mm. These dimensions correspond with those given by Jeffreys and subsequent systematic writers[1] and if the mature *lamellata* is much larger it seems to have escaped notice. *(d)* A seasonal fluctuation of the required degree is unlikely and is fairly well excluded by the specimens having been collected in February, June, July and October. (*e*) That twenty abnormal specimens should have been taken from among about 120 seems very improbable.

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[1] The presence of ova and spermatozoa in the hermaphrodite gland is of no great weight in this connection.

The provisional conclusion, therefore, is that this apparatus is all that *lamellata* usually has. Such an arrangement includes the really essential organs and presents no particular functional difficulties though it would require a good deal of ingenuity for two individuals to effect simultaneous rather than successive fertilisation. The normal helicid penis is after all much the same thing structurally as the vagina, and any protrusible tube would presumably do for an intromittent organ. Indeed, so far as I have been able to ascertain, no one has seen *lamellata* in copula[2] and it may be that it is self-fertilising. None of the specimens showed eggs or spermatozoa nearer the exterior than the hermaphrodite duct and they, therefore, throw no light on this question. The organ called the spermatheca is so identified on morphological grounds alone: I know nothing of its function.

The significance of genitalia so simple may be that the species represents a primitive or decadent type, and its curious geographical distribution in the north of England (with stragglers as far south as Berkshire), Scotland and throughout Ireland may, perhaps, be taken to favour such a view. An alternative, but not necessarily exclusive, hypothesis suggests that a small snail may have simple organs because there is not enough room for larger ones. On general grounds it seems likely that such components as nervous ganglia and eggs would be relatively larger in small than in large species; if this proves to be the case, it follows that some other parts must be reduced in size or suppressed.[3] There is too the highly significant fact that the smallest complicated animals are relatively large while simpler organisms pass by continuous gradations from submicroscopic to ultramicroscopic dimensions and have an inferior limit in the neighbourhood of molecular sizes. The smallest proctotrypid, trichopterygid or *Vertigo*

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[1] Jeffreys (1862) 0·09 in. (=2·3 mm.); Williams (1888) 2¼ mm.; Adams (1896) 2¼ mm. Swanton (1906) 2 to 2·3 mm.; Geyer (1909) 2 to 2·5 mm.

[2] My attempts to keep *lamellata* alive in captivity have miserably failed.

[3] *cf.* the suggestion of H. Watson (*Annals of Natal Museum*, vol. iii. (1915), p. 229) that the absence of large accessory organs on the genital ducts of *Testacella* is due to the great development of the buccal mass combined with the necessity of a slender habit of body.

is monstrous from the unicellular point of view and scarcely mi
scopic from our own; and if great reduction in size is necessa
associated with morphological simplicity it is possible that *lamel*
has a more elementary structure than *e.g.* ***nemoralis*** because it is at
one-thousandth as big. Whatever be the explanation in this partic
instance—and perhaps it lies in the concurrence of several facto
it is clear that comparative morphology has to take account of abso
size.[1] That all tiny snails should have the same simplicity is ha
to be expected; whether they have been derived from larger
smaller forms is probably a germane consideration.

Meanwhile much enquiry is obviously necessary. Observation
the breeding habits of *lamellata*, *aculeata*, *pygmæa*, etc., are requ
as well as on the anatomy of specimens from various localitie
different seasons of the year. I should be glad to have li
specimens of *lamellata* or any other small species, especially *pygn*
pulchella, any *Vertigo* including *edentula*, and *Cæcilioides*.

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Note on Conus traversianus Smith.—This beautiful Cone, placed in
sub-genus *Rhizoconus* by its author, was fully described in the *Journal of Co*
logy, vol. 1, pp. 107, 108 (1875). It was then unique, and having bee
possession of the type for nearly forty years, I take this opportunity of exhib
it, both to shew the unusual style of painting and pattern, and likewise as l
peculiarly associated with him whom all malacologists are mourning at the pr
time. This type is not in very first-class condition: the apex (as stated i
original description) is broken off, and there is a rather disfiguring seabre
front, near the mouth, which is not represented in the woodcut. But, dorsally
salient characters of the shell, and its banded and filletted ornamentation are sl
to great advantage. No longer, however, is it unique. Indeed it has been f
widely distributed through the eastern tropics. In the National Collectio
examples from Aden (Colonel J. W. Yerbury), and it is also reported fron
Persian Gulf (F. W. Townsend). The finest specimens I have myself obse
however, are now in the Folkestone Museum, three in number, and form pa
the Poynter Collection. In these the shell is considerably larger than the ty
a dark-brown orange, with rosy shading and effusion, the filletted decora
spoken of above standing out more clearly and conspicuously. They are evid
live examples. The habitat, Andaman Isles. The author named this most a
tive addition to the genus after, to quote his own words, "a young and c
student of this branch of zoology." It is no secret to say that it was giv
honour of Miss F. Travers, who was married to Mr. Edgar A. Smith the follo
year (July, 1876), and towards whom and her family, we are sure, the sinc
sympathies of all friends are directed at this time.—J. COSMO MELVILL. (
before the Society, Sept. 13th, 1916).

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[1] E. W. Bowell, *Proc. Holmesdale Nat. Hist. Club*, 1909, p. 79.

"LITTORINA LITTOREA (L.): A DOUBTFUL RECORD."

By J. C. DACIE.

(Read before the Society, September 8th, 1915).

THE note by Rev. Dr. A. H. Cooke in this *Journal*, vol. 14, p. 305, much interested me, as I somewhat specialize in the British *Littorinæ*, and have collected them in Scotland, in Islay, Iona, Oban and neighbourhood, Kyle of Loch Alsh, Stornoway (Hebrides), Thurso and the Pentland Firth, Stromness and neighbourhood (Orkneys), at Lerwick, Scalloway, Hillswick and neighbourhood (Shetlands), and on the east coast from Duncansby Head to Musselburgh.

Now, unless Mr. C. G. Hewitt walked into the lairs of some oyster catchers, or other sea fowl, the *Littorina*, which he records as having found "living in the crevices of the rocks at the top of Ruadval in St. Kilda, at a height of almost 450 feet above sea-level," was decidedly *not L. littorea* L., but would doubtless be that variety of *Littorina rudis* (Mat.), which—for want of a better name—is termed var. *jugosa* Mont.

From my experience with this *Littorina*—after several visits to the Orkney and Shetland Islands—I would say that it can be found on any of the rocky headlands and upon the cliffs of Scotland which are exposed to the full force of the Atlantic breakers. But, unless one is disposed to risk one's neck in seeking for it, it will escape collection altogether. In fact, it was not till my fourth visit to Stromness, in 1905, that quite by chance I reached Bigging Brough, a Plutonic headland which lent itself to an easy descent from the cliff to the actual sea shore, and that in this descent I was introduced to this special form of *Littorina rudis* (Mat.).

Since that date I have collected this *Littorina* twice in the Shetlands, and have discovered that it can always be found by descending from the top of the cliffs to exposed ledges of rock, where (in July and August, the months of my visits) the molluscs can only obtain water from the rains, which occur there very frequently, and that it can only be during the autumn and winter storms that the spray of the Atlantic ever reaches them.

At that wonder of wonders in rock scenery—the "Grind of the Naver"—and the Villians of Ure, near to the Head of Stanshi in Shetland, I found this *Littorina* at a tremendous height above sea-level and quite a quarter of a mile from the sea.

I have not yet visited the north-west and west coasts of Ireland, but would hazard that upon those rocky headlands and cliffs this *Littorina* would be found.

Surely this form wants naming or re-naming? *Littorina rudis* var. *jugosa* Mont. can be found upon any sea-shore where the type is plentiful, whereas this variety (or is it a distinct species?) is only found facing the Atlantic and at considerable heights above the sea-level.

Littorina rudis (Mat.) in some form or other is to be found on all of our shores, and as the varieties *lævis* Jeffreys and *tenebrosa* Mont. in most brackish waters also, where the size of their shells seems to vary in proportion to the salinity of their environment, *i.e.*, the larger the shell the more saline is the brackish water.

Hence it is a question whether the form under discussion is a true *Littorina rudis*, or not. However, if we admit the var. *tenebrosa* Mont., environment can do anything, and so, undoubtedly, I would say it is only a variety, which variety I propose to name var. *alticola*, and thus to indicate its life high above sea-level.

At a casual glance this var. *alticola* might be taken for a sickly *Littorina littorea* L. As compared with average sized *L. rudis*, the shell is large, and usually black, but from exposure becomes often very much weathered. All colours are to be found to white, and the shells are often banded. The shells of all specimens are thin, with a long-pointed spire, heavily ridged. The body-whorl is similarly ridged, but in some large specimens wears smooth. The ridges, especially those on the spire, seem to be a life-preserving feature, as they prevent the mollusc from being easily rolled away from the ledges and crevices of the rocks.

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Pisidium lilljeborgi in Carnarvonshire.—At the risk of being tedious I write to record two additional stations for *Pisidium lilljeborgi* in the Snowdonian Mountains. During the summer of 1916 I found it in plenty in Marchlyn Bach (1,557 feet), under the northern spur of Elidir Fach, and took several specimens in Llyn Peris (340 feet), the upper of the two Llanberis lakes. In a previous note on *P. lilljeborgi* (antea p. 96), I referred to the little tarn below the Y Garn precipices as Llyn y Cwm instead of Llyn cwm Clyd. Llyn y Cwm, the small peaty pool in the saddle between Y Garn and Glyder Fawr, is apparently devoid of mollusca, for I have searched it on several occasions without success.—CHAS. OLDHAM. (*Read before the Society*, February 14th, 1917).

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PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

454th Meeting, held at the Manchester Museum, Sept. 13th, 1916.

The President in the chair.

Additions to the Library announced and thanks voted :—

"On Two Species of *Pisidium* (fossil) New to Ireland"; "The Non-Marine Mollusca of South Galway," both by R. A. Phillips (*from the author*).

"On Some Cretaceous Brachiopoda and Mollusca from Angola, Portuguese West Africa," by R. Bullen Newton (*from the author*).

"(Obituary Notice of) Edgar Albert Smith, I.S.O." (not signed), (from R. Bullen Newton); and the usual periodicals received in exchange.

Donations to the Voucher Collection (per Hon. Recorder) announced and thanks voted :—

From Mr. J. Williams Vaughan: *Paludestrina jenkinsi*, a few from Brecon and and Newport Canal, in Llanwenarth parish, Monmouthshire, 7th July, 1916.

From Mr. Alex. Ross: *Helix aspersa*, a few, and *H. nemoralis*, a few, Isle of Whithorn, Wigtownshire, 17th July, 1916.

From Mr. H. Beeston: *Clausilia laminata*, two, Hyden Wood, near Clanfield, Hants South, 16th May, 1916.

From Miss Annie C. Jackson: *Hyalinia cellaria*, three from Swordale, Ross East, 7th June, 1916.

From Mr. G. Bathurst Hony: *Helix nemoralis* var. *libellula* 12045, one, Bulford Ranges, Wilts. South, 1916.

From Mr. Chas. Oldham: *Hyalinia alliaria*, *Clausilia bidentata*, *Pyramidula rotundata*, all from 2,000 feet altitude, at Cwm Idwal, Carnarvonshire, 24th June, 1916; *Hygromia granulata*, from Ceint, Anglesey, 21st June, 1916.

Member Deceased.

E. A. Smith, I.S.O.

New Member Elected.

Hamilton E. Quick, M.B., B.S., B.Sc. (Lond.), F.R.C.S.

Papers Read.

"Obituary Notice—Edgar Albert Smith, I.S.O.," by J. Cosmo Melvill, M.A., D.Sc., F.L.S.

"Note on *Conus traversianus* Sm.," by J. Cosmo Melvill, M.A., D.Sc., F.L.S.

"Sinistral *Limnæa pereger* and Its Progeny," by J. A. Hargreaves.

"Description of a New Rissoid Shell from South Africa," by J. R. le B. Tomlin, M.A.

"Note on *Helix pisana* at Swansea," by Capt. Hamilton E. Quick, R.A.M.C.

The following resolution was passed :—

> "That we, the Council and Members of the Conchological Society of Great Britain and Ireland, desire to place on record the profound sense of loss with which we have heard of the decease of Mr. Edgar A. Smith, and our appreciation of the invaluable services he has rendered not merely to us, as a Society, but to the whole scientific world.
>
> "That we hereby tender to his widow and relations our most respectful and sincere sympathy in their bereavement."

Exhibits.

By Mr. G. C. Spence: *Helicella barbara* var. *strigata* and var. *alba* from Mogador; *Hyalinia cellaria* and *Vallonia pulchella* from St. Helena; *Helix nemoralis* var. *minor*, *libellula* 00000, diam. 13 mm., alt. 8mm., from Rossall, near Fleetwood.

By Mr. J. C. Melvill: The type of *Conus traversianus* E. A. Smith to illustrate his note.

By Mr. R. Standen: *Neritina fluviatilis* from Loch ot Stenness, Orkney.

By Mrs. Gill: A large series of *Architectonica* and *Torinia*.

455th Meeting (Annual Meeting) held at the Manchester Museum, October 14th, 1916.

The President in the chair.

The following members and visitors were present:—Messrs. R. Standen, G. C. Spence, A. E. Boycott, J. F. Musham, G. Fysher, J. R. B. Masefield, J. W. Taylor, F. Taylor, E. Collier, W. D. Roebuck, E. D. Bostock, C. H. Moore, H. Allan, W. H. Davies, R. Jackson, Mr. and Mrs. J. W. Jackson, Mr. and Mrs. G. H. Taylor, Miss A. Jackson, Rev. E. H. Nash, Capt. W. J. Farrer, and Mrs. Gill.

Donations to the Autograph Collection announced and thanks voted:—

John Brazier, J. H. Gatliff, Mrs. Agnes Kenyon, and C. T. Musson. Donor: W. Denison Roebuck.

Donation of Photograph.

In commemoration of the fortieth anniversary of the Society's foundation, Mr. W. Denison Roebuck presented a fine framed photograph of the four original founders. The President accepted the gift on behalf of the Society, and thanked Mr. Roebuck for his interesting souvenir.

Appointment of Auditors.

Messrs. F. Taylor and C. H. Moore were appointed Auditors.

Appointment of Scrutineers.

Messrs. G. C. Spence and C. H. Moore were appointed Scrutineers.

Candidate Proposed for Membership.

William Henry Davies, 22, Pine Grove, Monton, Eccles, Lancs. (introduced by G. C. Spence and R. Standen).

Member Deceased.

John H. Ponsonby-Fane, F.Z.S.

Member Resigned.

W. Wells Bladen.

A Vote of Condolence with the Hon. Secretary on the death of his elder son in the Somme battle was passed unanimously.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for the year 1916–1917 had been elected as nominated by the Council (see p. 129).

Election of Honorary Member.

On the nomination of the Council, Lieut.-Col. H. H. Godwin-Austen, F.R.S., was unanimously elected an Honorary Member of the Society.

Presidential Address.

Mr. R. Standen gave his Presidential Address on "The Calcareous Eggs of Terrestrial Mollusca."

The Society's best thanks were voted to Mr. Standen; and the usual vote of thanks was passed to the authorities of the Manchester Museum.

Exhibits.

By Mr. R. Standen: A large series of Molluscan Eggs, with the parent, and embryonic shells of many species, to illustrate his address.

By Mr. E. Collier: Fifty-one species of shells collected at Gryon-sur-Bex (4,000 feet altitude), Vaud, Switzerland, during July and August, 1914.

By Mr. Fred Taylor: "Love-Darts" and shells of fifteen species of British land shells; *Helix hortensis* and varieties, including var. *roseozonata* from Llandovery, South Wales.

By Mr. J. W. Taylor: Living specimens of *Helix cartusiana* from Lewes, collected by Mr. C. H. Morris.

By Mr. G. C. Spence: Series of *Eucalodium*, including *E. anomalum* Strebel, *E. gigas* Mts., *E. recticosta* Pfr., and *E. crosseanum* Pfr.; type specimens of *Limicolaria abinsiensis*, and var. *aurea* S. and S.; a series of *Helices*, including living *H. lucorum* and *H. vindobonensis*, collected under shell-fire, near Salonika, in September, 1916.

By Mr. W. H. Davies: Models of the animals of *Helix aspersa*, *H. nemoralis*, *H. arbustorum*, and *H. lapicida*.

By Mr. C. H. Moore: A large series of land and freshwater shells from the United States.

By Rev. Canon J. W. Horsley: Specimens of *Limnæa*, *Planorbis*, and *Physa*, from Monte Lake, British Columbia.

By Mr. C. P. Hurst: *Clausilia rolphi* var. *albina* Schmidt, from hedgebank, near Bagshot, Shalbourne, June 10th, 1916.

By Mrs. Gill: *Norrisia norrisi*, *Latiaxis mawæ*, *Rostellaria powisi*, *Lampsilis purpurata*, *Scalaria pretiosa*, series of *Ovulum*, *Clanculus*, *Cylindrella*, and other genera.

By Mr. W. J. Davey: *Helix aspersa* and var. *exalbida* from St. Lawrence, Kent.

By Mr. J. R. B. Masefield: Living specimens of *Geomalacus maculosus*, adult and young, from South of Ireland.

By the Manchester Museum: A number of drawers of marine, land and freshwater shells from the reserve collections.

ANNUAL REPORT.

THE present is the thirty-ninth Annual Report of the Society. During the twelve months which have elapsed since our last annual meeting we have lost four members by death, five by resignation, and four names have been struck off the roll in accordance with Rule IV., making a total loss of twelve. On the other hand, nine new members have been elected; so that our membership now stands at 318.

The deaths that the Society has to deplore are those of Mr. John Hill, known to many members as a genial correspondent and enthusiastic collector; Dr. Kobelt, who was elected an honorary member in 1878; Mr. J. Ponsonby-Fane; and Mr. Edgar A. Smith, who both joined the Society in 1886. The obituary of Mr. E. A. Smith, so long the custodian of the conchological collections in the British Museum, has been read before the Society, and will appear shortly in the *Journal of Conchology*, the pages of which have been so often enriched by the records of his researches. The Society has placed on its minutes a special record of the great loss his death entails, not only upon those who have had the privilege of his friendship and experienced the genial courtesy of his willing helpfulness, but also upon present and future students of the mollusca throughout the scientific world. The Council has learnt with great satisfaction that, through the generosity of Dr. J. Cosmo Melvill, the figures of a number of type specimens from the Persian Gulf in the British Museum, described by Mr. Smith but not hitherto figured, were in course of preparation at the time of Mr. Smith's death, and will shortly be published.

The monthly meetings of the Society have been held regularly, despite the fact that the war has entailed upon members so many extra duties.

Some thirty papers and notes have been read, and special exhibits have been given in the following groups:—*Labyrinthus*, *Pteronotus*, *Ancilla*, *Alopia*, *Cyclostoma*, and *Terebra*.

, The *Journal of Conchology*, which started its fifteenth volume in January, has been published quarterly. The thanks of the Council are tendered to the following members, who have provided plates and figures at their own expense:—Messrs. Boycott, Collier, Melvill, Newton, Shackleford, Spence, and Tomlin.

The cordial salutations of the Society are given to members on active naval and military service.

TREASURER'S REPORT.

Statement of Accounts for the Year 1915.

RECEIPTS.	£	s.	d.
Cash in hand ...	26	12	4
Error cash in hand	0	10	0
Subscriptions	35	12	0
Advertisements	1	3	6
Sale of Publications ...	0	15	3
	£64	13	1

EXPENDITURE.	£	s.	d.
Cost of *Journal* for Jan., 1915	12	5	11
,, ,, Apr., 1915	13	6	6
,, ,, July, 1915	12	5	11
Cost of Illustrations ...	2	5	0
,, Reprints	2	10	0
,, Stationery	1	11	6
Taylor's Monograph, part xx.	0	5	3
Editor's Expenses	0	5	10
Secretary's ,, ...	6	8	6
Treasurer's ,, ...	0	17	6
Recorder's ,, ...	0	19	6
Cash in hand ...	11	11	8
	£64	13	1

RECORDER'S REPORT.

THE Hon. Recorder has to report that a fair number of specimens has been sent in by various observers and duly registered, but that there are many blanks in the Census still to be filled up, to which end the further energetic and steady co-operation of members and others is invited.

The Hon. Recorder, with the view of stimulating the investigation of Scotland, which offers so many problems of interest, especially in the matter of the northard range of various species and the influence of environment thereupon, has ommenced a series of papers in the "Scottish Naturalist" upon the more neglected ice-counties of Northern Britain. The first paper on Easterness appeared in May, nd the second on Main Argyll in September, while a third on Wigtownshire ppeared in the October and November numbers.

ANNUAL REPORT OF THE LEEDS BRANCH.

VE have had ten meetings during the year:—Four in the field, viz., at Heckmondvike in April; at Woodlesford in May; at Adel near Leeds in July; and at South Milford in September. No new species were added during the year, but our nowledge of the distribution of species is being extended.

Of the six indoor meetings, three were held in the University, Leeds, and three in the Cartwright Hall, Bradford. These winter meetings continue to attract an excellent attendance, with an average of thirteen members. Two of the meetings were devoted to a display of *Clausilia* and *Balea* respectively, and Mr. J. W. Taylor, M.Sc., gave a survey of the characteristics of the types and varieties, their biological peculiarities, and their distribution. As in the past, the members are greatly indebted to Mr. Taylor for the knowledge gained through his addresses. Mr. A. Hartley gave a paper on *Achatinellidæ*, illustrated by a fine display of specimens, and by numerous photographs of scenery, showing the varied habitats of this beautiful family in the Sandwich Isles. Mr. J. A. Hargreaves gave a practical paper on the Marine Mollusca of the Yorkshire coast, illustrated with specimens. He fully explained the methods of collecting, the habitats of particular species, and how to look for them. Both papers were most instructive.

Our membership is the same as last year—23, with three corresponding members. Mr. Greevz Fysher is our President.

F. BOOTH, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

NLY six meetings have been held during the past year. The war has claimed the hole time of several members, and most of the others have had little leisure for hells; consequently the attendance at all the meetings has been small.

Field-meetings were held at Mitcham, Swanley, and Putney, but nothing worth ecording was collected.

At the evening meetings various interesting shells were exhibited, especially *ygromia umbrosa* from Margate (already noted in the *Journal of Conchology*, vol. v., p. 11), and *Cassidaria rugosa* from the Irish Sea.

We are again indebted to Mr. J. C. Dacie for giving us house-room for the vening meetings.

J. E. COOPER, *Hon. Sec.*

456th Meeting, held at the Manchester Museum, Nov. 8th, 1916.

Mr. R. Standen in the chair.

Additions to the Library announced and thanks voted:—

"Zoological Results of the Abor Expedition, 1911-12: Mollusca, vi.," by Lieut. Colonel H. H. Godwin-Austen *(from the author)*.

"Description of a New Rissoid Shell from the Antarctic Region," by J. C. Melvill and R. Standen *(from the authors)*.

"Report on the Mollusca (Lancashire and Cheshire Fauna Committee, 1916)" by J. W. Jackson *(from the author)*.

"Monograph of the Land and Freshwater Mollusca of the British Isles," part 22, by J. W. Taylor *(purchased)*; and the usual periodicals received in exchange.

New Member Elected.

William Henry Davies.

Candidate Proposed for Membership.

John William Whitwell, 39, Queen's Way, Wallasey, Cheshire (introduced by John W. Taylor and R. Standen).

Papers Read.

"New Records for Glamorgan," by Douglas Bacchus.

"Where is the Male of *Paludestrina jenkinsi*?", by A. E. Boycott.

"The *Nerita jaculator* of O. F. Müller and *Paludestrina*," by A. E. Boycott.

"*Helicella virgata* (DaCosta) in Wirral, Cheshire," by J. Wilfrid Jackson.

Exhibits.

By Mr. J. Wilfrid Jackson: *Helicella virgata* from Meols, Cheshire, to illustrate his note.

By Mr. G. C. Spence: Japanese and Formosan *Cyclophorus*.

By Mrs. Gill: A series of *Placostylus*.

By Mr. W. H. Davies: An interesting series of Land and Freshwater Shells collected recently in the district of Eccles, Lancs.

It was decided to have the following Special Exhibits at future meetings:—

The Genus *Helicophanta*	January 10th, 1917.
The Genus *Rhysota*	February 14th, 1917.
The Genus *Ariophanta*	March 14th, 1917.

457th Meeting, held at the Manchester Museum, December 13th, 1916.

Mr. E. Collier in the chair.

Additions to the Library announced and thanks voted:—

"Faunula Littorinidæ Islandiæ Borealis," by Hans Schlesch.

"The Icelandic Pisidium-Fauna," by Hans Schlesch.

"Description of a New Rissoid Shell [*Microsetia durbanensis*] from South Africa," by J. R. le B. Tomlin.

"Two New Species of Marginella [*M. tomlini* and *M. taylori*] from South Africa," by L. J. Shackleford (*from the respective authors*); and the usual periodicals received in exchange.

Donations to Portrait Gallery—

By Lt.-Col. H. H. Godwin-Austen, F.R.S., an excellent portrait of himself, taken recently. The thanks of the Society were voted to the donor for this welcome gift.

New Member Elected.

John William Whitwell.

Candidates Proposed for Membership.

Henry Simpson Wallace, F.E.S., 6, Kayll Villas, Sunderland (introduced by J. R. le B. Tomlin and J. W. Jackson).

Dr. W. Horton-Smith, M.B., Ravenswood, Winnington, Northwich (introduced by B. R. Lucas and J. W. Jackson).

Member Deceased.

Rev. Prof. H. M. Gwatkin, D.D., M.A.

Paper Read.

"List of Sussex Marine Mollusca observed during the years 1912-1914," by Major H. C. Winckworth, R.A.M.C., and R. Winckworth, F.R.G.S.

Exhibits.

By Mr. G. C. Spence: A series of *Papuina*.

By Mr. W. H. Davies: A curiously distorted *Unio tumidus* from the canal at Worsley, Lancs.

By Mr. R. Standen: Eggs and shell of *Prosopeas achatinaceum* Pfr. from Java.

By Mr. W. Denison Roebuck: An ornamented 'Chank-Trumpet' (*Turbinella pyrum* L.) purchased by himself at Benares, India. Mr. J. W. Jackson briefly explained the rôle played by these shells in Hindu temple-worship.

By Mr. Arthur Smith (per Hon. Recorder): *Testacella haliotidea* Drap. from garden at Lincoln.

By Rev. G. A. Frank Knight: A specimen of the rare form, sub-var. *bifasciata* of *Helicigona arbustorum* L., from the Isle of Lismore.

By Mrs. Gill: A series of *Thais*, section i.

In the special exhibit of *Helicella* "*heripensis*" a large and interesting series of locality sets was exhibited by Messrs. J. D. Dean, J. A. Hargreaves, B. R. Lucas, E. Collier, J. W. Jackson, Rev. C. E. Y. Kendall, Rev. S. Spencer Pearce, Dr. R. F. Scharff, and the Conchological Society. Mr. W. Denison Roebuck exhibited a coloured map of the known distribution of the species in the British Isles.

458th Meeting, held at the Manchester Museum, Jan. 10th, 1917.

Mr. E. Collier in the chair.

Additions to the Library announced and thanks voted:

"Two New Land Shells from the Western States," by Paul Bartsch (*from the author*); and the usual periodicals received in exchange.

New Members Elected.

Dr. W. Horton-Smith, M.B.

Henry Simpson Wallace.

Candidate Proposed for Membership.

William James Wintle, F.Z.S., 18, Vincent Square, Westminster, S.W. (introduced by G. K. Gude and James E. Cooper).

Paper Read.

"Description of a New Species of *Terebra* from the Mekran Coast, Arabian Sea," by James Cosmo Melvill, M.A., D.Sc.

Exhibits.

By Mr. G. C. Spence: *Subulina* (*Itiopiana*) *meneliki* Preston, from Harar, Southern Abyssinia; *S. totistriata* Pils., from Soke, Senegal; and others.

By Mr. W. H. Davies: A large series of shells collected at Buxton, Derbyshire, including a *H. arbustorum* with a peculiarly channelled suture.

By Capt. W. J. Farrer: *Hemiplecta neptunus* Pfr., from Siam.

In the special exhibit, *Helicophanta*, many species were shown by Messrs. Spence, Collier, Lucas, Standen, and the Manchester Museum.

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DESCRIPTION OF A NEW SPECIES OF TEREBRA FROM THE MEKRAN COAST, ARABIAN SEA.

By JAMES COSMO MELVILL, M.A., D.Sc.

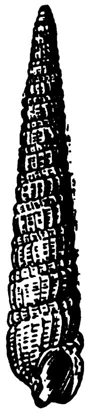
(Read before the Society, Jan. 10th, 1917).

Terebra [1]**trismacaria** sp. nov.

T. testa parva, gracilenta, angusta, anfractibus ad 17, quorum apicales quatuor pervitrei, pellucentes, lævissimi, cæteris gradatulis, costulis acutis regularibus ferè rectis vel interdum flexuosis longitudinaliter decoratis, spiraliter undique acutè liratis, liris anfractuum trium ultimorum ad 8, tænia suturali incrassata nitidè alba, nodulosa, sulco inter costas punctigero, apertura parva, margine columellari nitido, albo, calloso.

Long., 18 ; lat., 4 mm.

Hab., Mekran coast, probably off Charbar, but neither locality nor depth in fathoms precisely specified.



Terebra trismacaria sp. nov.

An attractive and delicately beautiful little shell, its whorls of the palest straw colour, excepting for the shining white nodulous sutural band, beneath which runs a spiral sulcus, punctate interstitially, between the ribs; these are mostly straight, occasionally slightly flexuose, acute and close-ranged, and are crossed by sharply defined regular spiral lirations. The aperture is very small, columellar margin thickened, shining white.

This *Terebra* will always have for me a particular interest, albeit tinged with saddened recollections, for it was, I think, the last species I was ever privileged to compare and discuss in company with one who had specially studied the genus—the late Mr. Edgar Smith. He could find nothing in the Museum Collection to exactly match it, and I agreed with him it was probably undescribed.

It is of the alliance of *T. alveolata* Hinds, *marmorata* Reeve, *helichrysum* Melv. and Stand., and others with well developed sutural band and puncticulate spiral sulcus. It differs from its congeners in its attenuate contour, very small aperture, subgradate whorls, the pale stramineous line centrally contrasting with the pure white shining nodulous sutural band, these nodules singly being continuations of the acute ribs.

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[1] τρισμάκαρ, thrice happy.

T. cælata Reeve is a broader shell, which likewise possesses a similar sutural tænia. Though small, the type appears adult.

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EDITORIAL NOTES.

WE regret to have to record the death of R. J. Lechmere Guppy, formerly a member of this Society, and well-known for his work in connection with the mollusca, both living and fossil, of the Island of Trinidad. He was born in London on August 15th, 1836, his father being the Hon. R. Guppy, barrister-at-law. By profession a civil engineer, he subsequently entered the Colonial Secretary's office in Trinidad, and in 1868 became Chief Inspector of Schools, a post which he held until 1891. Guppy contributed papers on recent mollusca to the 1st, 2nd and 7th volumes of this *Journal*, and many others to the *Annals and Mag. Nat. Hist.* and other periodicals. He was a prolific writer on the geology of Trinidad and other West Indian islands, and contributed largely to the publications of the London Geological Society. He died in Trinidad on August 5th, 1916, a few days before reaching his 80th birthday. I am indebted to Mr. R. B. Newton, an old friend of Guppy's, for these notes.

Professor Boycott sends the two following notes:—In the *Journal of Physiology* (vol. 50, 1916, p. 370) I. Leitch records a number of interesting observations on the function of the red respiratory pigment haemoglobin in *Planorbis* and *Chironomus*. He concludes that the animals are thereby able to make use of the oxygen in a deficiently aerated medium and that there is not enough haemoglobin to be of any practical use as a store of oxygen.

In the *Journal of the Royal Army Medical Corps* (vol. xxvii., 1916, p. 171) there is an interesting illustrated account, by R. T. Leiper, of some Egyptian freshwater mollusca with special reference to the occurrence of larval forms of parasitic trematode worms. The intermediate host of *Bilharzia mansoni* is *Planorbis boissyi*, while the larvæ of the other species parasitic in man, *Bilharzia haematobium*, have been found in *Bullinus contortus*, *B. dybowski (alexandrina)* and *B. innesi*. It appears that if these snails could be killed off, substantial progress might be made in dealing with *Bilharzia* disease, which is one of the curses of Egypt.

We welcome the appearance of part 22 of Mr. Taylor's Monograph, comprising the British species of *Hygromia*, with the exception of *granulata* Alder, and *Helicodonta obvoluta* Müll. Mr. Taylor is to be warmly congratulated on maintaining the high standard of his work in spite of the difficulties caused by depletion of staff, and the illustrations are as numerous as ever. The present number has a particularly interesting series of portraits. Apparently Lowe's record of *H. revelata* in a Notts. wood still needs elucidation. It is an extremely improbable one, and anyone who would ascertain what has become of Lowe's collection and, if possible, examine the supposed *revelata*, would do a real service.

A very interesting and comprehensive paper by Mr. J. W. Jackson, on "The use of Cowry-Shells for the purposes of Currency, Amulets and Charms," appeared in the Proceedings of the Manchester Literary and Philosophical Society towards the end of last year. It is a mine of information on the subject and seems to have collected in a concise and well-grouped form all the facts so far published. The occurrence of *Cypræa moneta* L. or *C. annulus* L. on the West African coast is, we admit, very problematic, though Weinkauff, as well as Rochebrune, definitely asserts that he has found *C. annulus* "avec l'animal vivant," in Algeria. Jousseaume gravely asserts the occurrence of *C. moneta* living at Boulogne-sur-Mer! We should certainly ascribe all these occurrences to commerce, and a strong argument in favour of this view is that Adanson, in the middle of the 18th century, has no mention of these cowries in his "Hist. Nat. du Sénégal" (cf. Dunker, Index Moll. Guin., p. 31).

CENSUS AUTHENTICATIONS.

By W. DENISON ROEBUCK, M.Sc., F.L.S., Hon. Recorder.

All the records here given are based upon examples submitted to the official authenticators; myself for slugs only; Mr. F. Taylor for *Paludestrinidæ*; and Mr. John W. Taylor for all other species.

Aberdeenshire North: The Rev. G. A. Frank Knight has submitted an example of *Succinea putris*, taken along with a couple of *S. elegans* at Collieston.

Aran Islands (Galway West): Dr. R. F. Scharff has submitted various forms of *Helicella itala*, including var. *minor*, whitish ones, and forms with two and three bands above the periphery, and *H. virgata* var. *albicans*, all collected by himself on the Aran Islands in September, 1891. The Hon. Recorder will be pleased if workers will contribute further specimens from these islands, an outlying group of v.c. Galway West, as a separate record is kept of them for the next Census.

Bucks.: Prof. A. E. Boycott has presented to the Voucher Collection an example of *Acicula lineata polita* taken 12th September, 1916, at Great Hampden.

Gloucester East and **Gloucester West**: Mr. C. Upton has presented to the Voucher Collection *Amphipeplea glutinosa*—abundant at Chalford in the Thames and Severn Canal, which is at this point the boundary between vice-counties 33 and 34.

Hampshire North: Mr. A. M. Oliver has presented to the Voucher Collection a few examples of *Paludestrina jenkinsi* taken in the Basingstoke Canal near Crookham.

Hampshire South: Mr. H. Beeston submitted a number of examples of *Helicella cartusiana* from Farlington Marshes, near Havant, taken September, 1909; the marsh habitat is interesting. Mr. L. Dawes has sent *H. heripensis* from Hambledon.

Hunts: Rev. C. E. Y. Kendall has submitted *Helicella heripensis* from various localities in this county, viz.:—several type and two var. *grisescens* from Chesterton, several type and var. *lutescens* from Alwalton, several type from St. Neots, Haddon, and Stibbington.

Kent East: Several *H. heripensis* from Canterbury have been submitted by Messrs. R. Standen and J. W. Jackson.

Kerry North: Mr. G. Fysher sent *Helix aspersa* along with other species, collected by him on the 18th May, 1915, at Lahern Cross, between Farranfore and Castle Island. He also collected at Killarney on the 17th May one *Hyalinia lucida* and a few *H. alliaria* at Kenmare Gardens, a few of the last-named with one var. *viridula*, and a couple of *H. cellaria*, all on the Ross Castle road : these are all in the Voucher Collection.

Kincardineshire: Mr. J. Simpson, of Aberdeen, has presented to the Voucher Collection numerous examples of *Limnæa pereger* from the Lock of Loriston. This completes the Census for this ubiquitous species, not merely for Scotland, but for the main island of Great Britain ; and the only three vice-counties of Ireland for which authentication is needed are Longford, Cork North-West, and Cork South-West.

Leicestershire-with-Rutland : Rev. C. E. Y. Kendall has submitted a *H. heripensis* taken 28th March, 1910, at Waltham-on-the-Wolds.

Co. Limerick : Miss Annie L. Massy submitted the following, which she took in November, 1898, in Glenacurrane (published as Glen of Currane in the "Irish Naturalist") : *Hyalinia alliaria*, two juv., *H. pura* varr. *nitidosa* and *margaritacea*, several, *H. radiatula* var. *viridescenti-alba*, one, *Acanthinula lamellata*, several, and *Acicula lineata*, one juv.

Merionethshire: Mr. E. Collier has submitted three *H. heripensis* taken at Barmouth.

Middlesex : Mr. C. Oldham has submitted from Harefield, 18th October, 1916, three *Helicella itala* var. *minor*, three *H. heripensis* and three *Pupa secale.*

Monmouthshire: Prof. A. E. Boycott has presented to the Voucher Collection *Neritina fluviatilis* from the River Wye at Symonds Yat, at a bend where the species occurs in the three counties of Monmouth, Hereford, and Gloucester West.

Norfolk East: Mr. C. Oldham has submitted *H. heripensis* from Cley-next-the-Sea.

Northamptonshire: Mr. C. Oldham has submitted a few *Pisidium supinum* from the Grand Junction Canal at Stoke Bruerne, 13th October, 1916; *H. heripensis* and var. *lutescens* from Roade, same date ; and the same species with varr. *lutescens*, *hyalozonata*, and *alba* from Deanshanger, 19th Oct., 1916.

Northumberland South : Mr. A. M. Oliver found some *Pisidia* plentiful in a small pond at Heatherleazes, near Warkworth, in July, 1910: those sent were a couple of *Pisidium obtusale* and one of *P. subtruncatum.* Others from a stream at Druridge Bay the same month included *P. subtruncatum* and *P. pusillum.*

Oxfordshire: Mr. E. D. Marquand has submitted two small *Amphipeplea glutinosa* from Oxford.

Pembrokeshire: Mr. J. Davy Dean has submitted an example of *Acicula lineata polita* taken at Saundersfoot Glen, September, 1915.

Perth South with Clackmannan : The Perth Museum has submitted several *Balea perversa* taken by Mr. F. Smith at Braco, 19th August, 1908.

Renfrewshire: Several examples of *Pisidium obtusale*, taken in company with numerous *P. pusillum*, at Barnbeth Dam, near Bridge of Weir, by Dr. David Robertson, have been submitted by the Kelvingrove Museum, Glasgow.

Shropshire: Mr. C. Oldham has sent a fine example of *Limax tenellus* which I refer to var. *fulva*, which he took in the Shropshire portion of the Forest of Wyre, on 17th October, 1915. This example will be preserved for the museum at Shrewsbury. On the same day Mr. Oldham took a couple of examples of the same species and variety in the Worcestershire portion of the same forest, which is an oak forest.

Somerset North: During a stay at Weston-super-Mare in June, 1916, Mr. John W. Taylor met with *Hyalinia helvetica.*

Stirlingshire: Mr. W. Evans has submitted examples of *Sphærium lacustre* var. *ryckholtii* from the duck-pond at Dunipace, found 25th May, 1911.

Suffolk East: Examples of *H. heripensis* have been submitted by Messrs. R. Standen and J. W. Jackson; three from Blaxhall and two from Coddenham.

Suffolk West: Mr. A. Mayfield has submitted *Pomatias elegans*, taken near Lavenham.

Sussex East: Examples of *H. heripensis* collected by Mr. A. G. Stubbs have been submitted by Messrs. R. Standen and J. W. Jackson; numerous specimens from Eastbourne in 1899, and several from Lewes. Mr. E. D. Marquand has sent numerous *Phytia myosotis* var. *denticulata* from the River Ouse at Seaford.

Sussex West: Mr. H. Beeston has submitted *H. heripensis* as follows: Aldsworth near Emsworth, numerous, September, 1902; East Ashling near Funtington, several, September, 1915; Houghton near Amberley, numerous; Rackham near Amberley, several; Bignor, several; all October, 1916, the two latter in company with *H. caperata.* Rev. W. A. Shaw submitted *Pisidium cinereum* from a dried-up stream at Chidham, picked up in the autumn of 1911.

Warwickshire: Mr. G. Chambers has submitted a considerable number of species collected at Moreton Morrell near Leamington, amongst which were a few each of *Vallonia excentrica*, *Pomatias elegans* and *Pisidium subtruncatum.* He also sent a couple of *H. heripensis* taken by the canal at Leamington, June, 1916. Mr. W. T. Elliott has sent examples of *Arion subfuscus* and *Testacella scutulum* from Tanworth-in-Arden, and of *T. haliotidea* from Stratford-on-Avon, taken 1912. These were all in alcohol, so that it was not possible to state the variety of the *A. subfuscus.* On the 16th April he sent a living example of typical *Limax cinereo-niger*, about half-grown, also from Tanworth-in-Arden.

Co. Waterford: Mr. E. D. Marquand has submitted several examples of *Paludestrina stagnalis* collected by Mr. J. R. le B. Tomlin at Waterford.

Wilts. North: Mr. C. P. Hunt has sent numerous examples of *Pomatias elegans* from a hedge-bank near (and north of) Great Bedwyn, June, 1915. These are now in the Society's Voucher Collection.

Worcestershire: Mr. E. Collier has submitted a few *H. heripensis* taken in company with *H. caperata* at Broadway, August, 1915.

Yorkshire Mid-West: It is not often that anything can be added to the fauna of this vice-county, but Mr. H. Beeston has sent an immature example of *Azeca elongata* Tayl., which he found at Barnoldswick in 1914.

Yorkshire North-East: Mr. J. A. Hargreaves has submitted numerous examples of *H. heripensis*, taken on the Ayton Road, near Scarborough.

Yorkshire South-East: Mr. W. Gyngell has submitted examples of *H. heripensis* taken in an old chalk pit on Willerby Wold, which is about six miles west of Hunmanby.

Yorkshire South-West: A couple of examples of *Vallonia excentrica* from Bradford, from Mr. J. R. le Brockton Tomlin, have been submitted by Mr. E. D. Marquand.

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OBITUARY NOTICE: REV. LEWIS J. SHACKLEFORD.

BY R. STANDEN.

(Read before the Society, May 9th, 1917).

THE Society has sustained a severe loss in the person of its Honorary Secretary, the Rev. L. J. Shackleford, who passed away on April 13th, after a long illness, in his sixty-first year.

He was trained for the Baptist ministry at Rawdon, and settled in his first pastorate at Ripley in 1879. Five years later he was selected to fill an important vacancy in New Zealand, and ultimately removed to Adelaide, South Australia. Returning to England in 1897, he was appointed to a church in Clitheroe, and from there removed to Blackburn. While in the Blackburn area he devoted himself to research work in connection with the Ice Age phenomena of the Ribble Valley from Malham in Yorkshire to the sea at Blackpool, making a special study of the sea-cliffs at Bispham. He published several important papers, which he ultimately embodied in a book called "The Story of the Great Ice-Age in the Fylde and Ribble Valley," illustrated with many of his own photographs.

Mr. Shackleford joined the Conchological Society in 1893, and was elected Honorary Secretary in October, 1907, which post he held to the time of his death. He was a regular attendant at the meetings till towards the close of last year, when failing health prevented him from taking the journey from Blackpool. His last appearance was at the Annual Meeting, held in Manchester, on October 14th, 1916.

For a number of years he was a Field Lecturer in connection with the Co-operative Holidays Association; and some fifteen months ago he was made President of the Blackpool Microscopical Society.

While in the Antipodes he began his fine collection of marine shells, of which the *Volutidæ* were his special favourites. He possessed a wide and accurate knowledge of many special groups, and was particularly interested in the mollusca of Lifu, Loyalty Islands, a species of *Nassa* from there being named after him. A species of *Marginella* also bears his name.

Of late years he did a large amount of research work in connection with the mollusca of São Thomé.

He bequeathed his fine collection of *Marginellidæ* to the Ma chester Museum.

LIST OF PAPERS.

The Shell-Boring of Carnivorous Gastropods. *Journ. of Conc* vol. viii., 1896, p. 315.

Two New Species of *Marginella* from South Africa. *Annals* *the South African Museum*, vol. xiii., pt. iii., May 7th, 1914.

Two New Species of *Marginella* from South Africa. *Ibid.*, vo xiii., pt. v., Oct. 6th, 1916.

IN COLLABORATION WITH J. R. LE B. TOMLIN.

Descriptions of Two New Species of *Marginella* from São Thomé Island. *Journ. of Conch.*, vol. xiii., 1912, p. 319.

Descriptions of Two New Species of *Marginella* from São Thomé Island. *Ibid.*, vol. xiv., 1913, p. 11.

Descriptions of New Species of *Marginella* and *Mucronalia* from São Thomé. *Ibid.*, vol. xiv., 1913, p. 43.

Note on the *Caryatis belcheri* of Römer. *Ibid.*, vol. xiv., 1913, p. 96.

The Marine Mollusca of São Thomé, I. *Ibid.*, vol. xiv., 1914, p. 239.

The Marine Mollusca of São Thomé, II. *Ibid.*, vol. xiv., 1915, p. 307.

IN COLLABORATION WITH G. C. SPENCE.

On a Supposed New Species of *Limicolaria*. *Journ. of Conch.*, vol. xv., 1916, p. 127.

Note on Helix hispida var. **mörchi** Westerlund.—In several of Dr. C. A. Westerlund's works his *Helix hispida* var. *mörchi* is recorded as having been found on Iceland, but I have never found *Helix hispida* on Iceland, nor seen it noticed in collections from that island, and as Westerlund describes the original locality as a garden near Thorshavn (=Thorshöfn) situated in the north-east part of Iceland, I got a doubt that Westerlund has miswritten Iceland for Faroe Islands, and this so much the more possible as Westerlund in "Vega Exp. Vetenskapl. Sakttagelser," vol. iv., p. 145, in the part concerning Faroe Islands, gives a list about the molluscan fauna there: in this list we also find the *Helix hispida* var. *mörchi* noticed as being found in a garden by Thorshavn. That the *Helix hispida* has been found on the Faroe Islands can also be seen from Mörch's note in "Videnskablige Meddelelser fra Naturhist. Forening, København," 1867, p. 100.—HANS SCHLESCH (*Read before the Society*, Sept. 13th, 1916).

New Records for Glamorgan.—On October 1st, 1916, I took a specimen of *Milax gagates* var. *rava*, about two-thirds grown (kindly identified by Mr. Roebuck) under a stone on a sandy bank at Sully, Glamorgan. Early in 1915 I took specimens of *Limnæa stagnalis* in the Lily Pond, Alexandra Park, Penarth, where it is still abundant.—DOUGLAS BACCHUS (*Read before the Society*, Nov. 8th, 1916).

OBITUARY NOTICE: J. H. PONSONBY-FANE, F.Z.S.

BY J. COSMO MELVILL.

(Read before the Society, May 9th, 1917).

JOHN Henry Ponsonby-Fane passed away at Brympton, Yeovil, on 11th September last, in his sixty-ninth year. He had for some little time been in failing health, but this did not dim his vivid interest in malacological science, more particularly as regarded the non-marine mollusca. His knowledge of the *Helicidæ*, to mention but one large group, was almost unequalled. His attention was especially drawn towards the South African fauna, since the time of Krauss somewhat neglected, and between 1890 and 1909 inclusive, in collaboration with the writer of this notice, descriptive papers, about twenty in number, appeared in the pages of the "Annals and Magazine of Natural History" on this subject. Altogether the new species proposed totalled, speaking roundly, 250—almost doubling those previously recorded. It is true that some of them, intermediates having been since discovered, are now either considered varieties, or have been relegated to synonymy; but the majority have passed through the crucial furnace of criticism unscathed.

High-minded, modest, chivalrous, and withal most charming of characters, his loss is indeed deemed irreparable by his many friends, and not least by myself. The style of his letters was delightful; they all seemed to breathe an old-world courtesy; and when, as was rarely the case, a little argument on some knotty point was necessary, it would be so well put as never to give the slightest cause for offence; indeed, all these letters are well worth most carefully preserving, being so characteristic of his nature; but we are sure such an idea would have been thoroughly deprecated by him!

We were at school together at Harrow in the early sixties; but as I was more than three years his senior, we were not thrown much together in those pristine days. It was not till 1887-88 that we decided to join our forces in the effort just mentioned.

His other papers, of which I give a brief enumeration, were but few in number. "A Check List of the Non-Marine Mollusca of South Africa," though brought out in our joint names, was in reality in most part his own most careful work, unaided. We likewise collaborated in one or two other papers, *e.g.*, the collections of land shells made by the late Mr. Theodore Bent in the Hadramaut district of South Arabia.

His enumerations of the species contained in the genera *Sculptaria* Pfr. and *Libera* Garrett shew much discernment and accurate knowledge. One or two other sections of the *Helicidæ* he had likewise taken up for study shortly before his illness. Of these, I should like some day to present his views on the genus *Leucochroa*, as I had considerable correspondence with him on the subject. He had done much personal collecting of this group in Morocco and elsewhere.

Every winter he travelled abroad, so as to escape our insular fogs and inclement, treacherous weather, and thus in turn the south of Europe, Algeria, Morocco, Tunis, the Canaries and Madeira, Natal, the Cape, and some of the West Indies, notably Trinidad, were visited. At each place, he made a point of carefully studying the land fauna and thus acquired large suites of fine specimens. This aided in rendering his cabinets replete with rare *Helicidæ*, and other non-marine families, of which his collection became one of the most complete in existence. He also corresponded and exchanged largely with most conchologists of note, both at home and abroad.

He was the eldest son of the late Rt. Hon. Sir Spencer Ponsonby-Fane, G.C.B., formerly Comptroller of the Lord Chamberlain's Department, Royal Household. In his youth he followed his family traditions in becoming a cricketer of some note, playing in the Harrow School XI. in 1866. Wicket-keeping was his forte; and he had the advantage of being "coached" by his uncle, the late Hon. Frederick Ponsonby (afterwards sixth Earl of Bessborough), who, every half-holiday during the summer term, would drive down from London to supervise and train the boys in the "king of games."

For some years he was managing director of Messrs. Herries, Farquhar & Co.'s Bank in St. James' Street, afterwards incorporated with Lloyd's Bank, Ltd., but retired some years before his death.

He succeeded his father in the Brympton d'Evercy estates, Somersetshire, as recently as December, 1916, when he assumed the additional patronymic of Fane.

In 1876 he married Florence, daughter of Mr. Harvie Morton Farquhar, and she, with a son and daughter (Mrs. E. Clive), survives him.

Among the writings of Mr. Ponsonby-Fane may be mentioned the following:—

(A).

1. List of Shells found in the Neighbourhood of Yeovil, Somerset. *Journ. of Conch.*, iv., p. 245, 1885.
2. Additions to the Land Shells of Gibraltar. ib., p. 266.
3. Remarks on the Land and Freshwater Mollusca of the Maltese Islands. ib., p. 280.
4. On the Land Shells of Gibraltar. ib., v., p. 194, 1886.

5. Descriptions of *Helix parryi* and *Pupa pyramidula* spp. n., from Teneriffe. Proc. Malac. Soc., i., p. 55, 1894, figs.
6. Description of *Nanina* (*Sesara*) *episema* sp. n. ib., p. 56, fig.
7. Description of *Xanthomelon bednalli* sp. n., from Central Australia. ib., vi., p. 182, 1904, fig.
8. Descriptions of *Rhytida bednalli* and *Coliolus thrix*, spp.n., from German New Guinea. ib., vii., p. 224, 1907, figs.
9. Notes on *Sculptaria* Pfr. ib., ix., p. 34, 1911. Four species diagnosed.
10. Notes on the genus *Libera* Garrett. ib., ix., p. 37. Ten species admitted.

(B).

IN COLLABORATION WITH E. R. SYKES.

1. On *Planispira buruensis* and *Omphalotropis hercules* spp. n. Proc. Malac. Soc., vi., p. 307, 1906, figs.

(C).

IN COLLABORATION WITH J. C. MELVILL.

1—20. Descriptions of New Species of Terrestrial and Fluviatile Mollusca from South Africa.

A series of twenty papers extending through nineteen years (December, 1890—1909). In these between 240 and 250 species considered new to science are diagnosed and commented upon, all being figured. All are published in the sixth, seventh, and eighth series of the "Annals and Magazine of Natural History."

21. A Check List of the Non-Marine Mollusca of South Africa. Proc. Malac. Soc., iii., p. 166, 1898.

22. On the South African Species and Varieties of *Pupa* Drap. (*Jaminia* Risso) from South Africa. Ann. and Mag. Nat. Hist., ser. viii., vol. i., p. 70, plate 1, January, 1908.

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23. Descriptions of Seven New Species of Terrestrial and Fluviatile Mollusca from the Hadramaut, South Arabia. Proc. Malac. Soc., ii., p. 1, plate 1, 1896.

Seven species described, of which several belong to the genus *Otopoma*.

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24. Description of *Achatina studleyi* n.sp., from Old Calabar, West Africa. ib., p. 291., fig., 1897.

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ADDITIONS TO "BRITISH CONCHOLOGY."

By J. T. MARSHALL.

PART VII. *(concluded from p. 174).*

Mr. James Simpson, who has had some experience of this curious and interesting species, writes that although various species of Echinidæ are said to provide a host for the *Stilifer*, he has "never found them on any other than the one species—*Strongylocentrotus dröbachiensis* Müll., although *Echinus esculentus* [which is supposed to be its favourite host] is quite as abundant on the same grounds."[1] He agrees generally with the observations of Gwyn Jeffreys, which were founded on a pair of *Stilifers* dredged in the Shetlands,[2] and he adds: "*Stilifer* is invariably found among the spines on the upper surface of the sea-urchin; I have never seen them on the lower side near the mouth. It creeps about the base of the spines by means of its comparatively large foot, and deposits its ova upon the urchin in a minute oval gelatinous sac. Sometimes there are so many of these little patches of ova that they give the urchin a somewhat diseased appearance. One that I examined had 34 of these patches; whether they were all from the two *Stilifers* that were upon their host I am not prepared to say. One of these sacs was more developed than the rest, so much so that the little mollusc could have been identified by its shell alone. As many as ten *Stilifers* have been found on a single *Echinus*, but three seems to be the average."

Mr. Simpson also writes that he is inclined to doubt Gwyn Jeffreys' statement that Dr. MacGillivray's specimen was "a young West Indian land shell belonging to the Cyclophoridæ,"[3] because, he says, *Stilifer* is frequently found off Aberdeen, and that as MacGillivray even mentions the finding by one of his pupils "of a specimen adhering to an Actinia at Footdee as far back as 1842," he must have been more or less acquainted with the shell, and that he gave a good description of it in his "Mollusca of Aberdeen" under the name o *Stylina stylifera*."

Eulima, Risso.—Gwyn Jeffreys has written that *Eulima* is "no parasitic,"[4] and that although "species of *Eulima* have been found i the stomachs of *Holothuriæ* . . . . . . this is not a case of parasitism the *Eulima* feeds the *Holothuria* instead of feeding upon it." (p. 194 This may be so in some cases, but subsequent research points to th fact that certain *Eulima* are distinctly parasitic. Besides Profess

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[1] Trans. Aberdeen W.M. Nat. Hist. Soc., 1903, pp. 79-80.

[2] *Brit. Conch.*, vol. iv., p. 197.

[3] *Brit. Conch.*, vol. iv., p. 196.

[4] *Brit. Conch.*, vol. iv. p. 190.

Sars' discovery of *E. philippii* inside *Holothuriæ*, M. Graff has taken *Eulimæ* abundantly on the starfish *Comatula mediterranea*, and Dr. Boog Watson constantly on *Echinus esculentus*.

Eulima intermedia, Cant.—A shell indicated and figured under the name of *E. frielei*, but imperfectly described,[1] appears to differ in no particular from *E. intermedia*, or if it does the difference is not mentioned by its sponsor, nor is it apparent in the figures, or the text, or the shell itself, which the owner sent me and asked for my "favourable" opinion, but, as I informed him, it is a not uncommon form of that species.

The preceding remarks largely apply to figures of a shell indicated as *E. pernula*,[2] which unmistakably represent forms of *E. intermedia* found not uncommonly among Guernsey and Scilly *Eulimidæ*.

The figures omit the only critical characteristic of the *Eulimidæ* in the absence of any other criterion—a microscopic enlargement of the embryonic whorls, which should be minutely described and specially figured. Mere outlines of the *Eulimidæ* are so especially capricious and misleading as to be useless for scientific comparison.

E. anceps, Marsh.—Living in the Mediterranean, and also a fossil of Ficarazzi (Monterosato *in litt.*) Also Adventure Bank 120f. ('Shearwater')! and from the same district in 92f. ('Porcupine')!

E. anceps has been figured,[3] but the figure is no guide except as an outline, while the apex should be blunt instead of pointed, and the mouth larger proportionately.

I am not altogether satisfied with this as a species. Remembering how polymorphous and misleading the shell of *E. intermedia* frequently appears to be, if it can occasionally put on a blunt apex and a concave profile it might conceivably include my *E. anceps*, and a few specimens from Guernsey certainly appear to connect the two.

E. curva Monts.—Two excellent figures of this shell have been published in the journal last quoted (figs. 1 and 6).

E. philippii Weink.—The same journal also gives perfect figures of the two forms of this species (figs. 3, 4) which I selected for the writer at his request, to represent what I have already described as the northern and southern forms.[4] Fig. 3 is the southern form on the British coasts, and fig. 4 the northern one. They are figured under the name of *E. incurva*, Ren.

var. **gracilis** F. & H.—Those who maintain that this is a distinct species should have faith in their convictions and endeavour to meet and confute the conclusions arrived at by competent authorities who have worked out the subject. The Tomlin collections contain a series of intermediate specimens that could be assigned to either the type or the variety, and either assignation would be correct.

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[1] Proc. Malac. Soc., 1895, vol. i., p. 266, pl. xvi., fig. 6.

[2] Proc. Malac. Soc., 1903, vol. v., p. 352, pl. xiv., figs. 2, 10, 12.

[3] Proc. Malac. Soc., 1903, vol. v., p. 348, pl. xiv., fig. 11.

[4] *Journ. of Conch.*, 1901, vol. 10, pp. 125-6.

With respect to my contention that Forbes and Hanley figured another shell in mistake for the var. *gracilis*, Mr. Sykes is good enough to say that he is "unaware what authority there is for the statement that the figure represents a different species to that described."[1] The authority of course is my own, whatever that may be worth; but if corroboration were needed it may be deduced from Forbes and Hanley's own words, which I quoted.

var. **monterosatoi** Marsh. non *E. monterosatoi* (De Boury MS.) Monterosato.—This has been figured by Mr. Sykes as a new species under the name of *E. collinsi.*[2] The figure is a good one so far as it goes, and well indicates the outlines and proportions of the shell.

My citation of var. *monterosatoi* for this variety of *E. philippii* arose from the misinterpretation of a note from the Marquis di Monterosato, who sent me a specimen, asked if it was known to me, and if so whether I could forward him British examples, with others of var. *gracilis* for comparison. I did so, and in his reply he quoted the names of *E. gracilis* Forbes and *E. monterosatoi* De Boury for the two forms, without explaining that one was a synonym of the other, whereupon I concluded that the *monterosatoi* form was a new variety, and so adopted it.

E. ? perminima Jeff.—I am not satisfied with the position of the shell placed by me under this name,[3] but as there is only one specimen I leave it here provisionally. The Marquis di Monterosato, who has seen it, writes me—"Not *E. perminima* from author's type in my collection." But he does not venture to assign it to any other known species. Nor does the figure of it[4] give any help; the latter, when magnified, looks like an adult *E. philippii* var. *gracilis*, but when compared with a young specimen of the latter of the same size, this minute shell seems strikingly different.

E. subumbilicata Jeff.—Two specimens of a *Eulima*, dredged by the Scottish Fishery Board off the Butt of Lewis in 545f., have been assigned by Mr. Simpson to this species, as they agree "in most particulars" with that species, except that they are transparent and glossy instead of "creamy white" (which is the normal difference between a fresh and a dead *Eulima*), and "the last whorl is nearer half the length instead of two-thirds."[5] Gwyn Jeffreys' *E. subumbilicata* was founded on a solitary example dredged in the 'Porcupine' expedition of 1870 off Cadiz, in 322 fathoms.[1]

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[1] Proc. Malac. Soc., 1903, vol v., p. 351.

[2] Proc. Malac. Soc., 1903, vol. v., p. 349, pl. xiv., fig. 8.

[3] *Journ. of Conch.*, 1901, vol. 10, p. 127.

[4] *Journ. of Conch.*, 1912, pl. 5, fig. 3.

[5] Notes on Rare Moll., *Journ. of Conch.*, 1910, vol. 13, p. 113.

E. stenostoma Jeff.—North Sea 74f., off the Shetlands 65f., and between the Shetlands and Norway 63f. (Simpson)!

E. ephamilla Wats.—The Marquis di Monterosato considers that my specimens of this shell are his "*E. compactilis* = ? *E. obtusa* Jeff. *non* De Fol.," and that *E. ephamilla* Wats. is distinct; but while I consider my British specimens (more than a score) identical with Boog Watson's, I cannot speak with any certainty as to their relation to *E. compactilis* Monts., not having seen that species. My specimens were verified by the author (Boog Watson), and also examined, compared, and accepted by Mr. Edgar Smith and myself.

E. bilineata Ald.—Straits of Korea 20f. (H.M.S. 'Sylvia')!

var. **exigua** Marsh.—Living in the Mediterranean and fossil at Ficarazzi (Monterosato).

A species of *Eulima* which may be new, and has been named *E. Martyn-jordani*,[2] was dredged by the 'Triton' in the Shetland-Faroe Channel. I have not seen this shell, but except perhaps in size it cannot differ much from *E. minuta* Jeff., an Atlantic shell dredged by the 'Porcupine.' It may be a large form of that species.

Natica islandica Gmel.—Off Fair Isle (Simpson).

N. sordida Phil.—Doggerbank, rare, dead (Parke); Aberdeenshire, two dead specimens (Simpson).

I have previously expressed "great doubts about Mr. Clark's Exmouth record for this species." It comes under the same suspicion that I have noted in the case of *Galeomma*, and I cannot think that either of these species are likely to be found in South Devon. I dredged and collected all over the South Devon coast during my 20 years' residence at Torquay, and particularly those parts adjacent to Exmouth—such as Dawlish, Teignmouth, Babbacombe, &c. I also had the services, in my holiday visits of earlier years, of Branscomb, Mr. Clark's dredger, who was then getting past work, but who took me to where he said these species had been obtained, though unfortunately we could never confirm the discovery. Mr. Clark's collection, which was subsequently purchased by Gwyn Jeffreys, certainly contained a specimen of *N. sordida*, but I do not think it was found in South Devon.

N. catena var. **leckenbyi** Marsh.[3]—This has a very deceptive resemblance to some examples of *N. sordida*—in fact they deceived Gwyn Jeffreys at first sight, who at once called them *N. sordida*, but corrected himself on a second examination. I have dredged it only once, and that was on a shallow bank in the centre of the Doggerbank, in ten fathoms.

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[1] Moll. 'Lightning' and 'Porcupine,' Proc. Zool. Soc., 1884, p. 370.

[2] Proc. Malac. Soc., 1895, vol. i., p. 266, pl. xvi., fig. 5; Proc. Malac. Soc., 1903, pl. xiv., fig. 7.

[3] "North Sea Dredging," Ann. Mag. N. Hist., 1875, vol. 16, p. 392.

var. **conico-ovalis** Jeff.—This is a rare variety, and only occasionally met with. Mr. Bartlet Span's collection contains an elongated monstrosity of this form, found at Laugharne, which has the proportions of *Paludina vivipara*. An excellent figure of it will be found in *Journ. of Conch.*, 1905, vol. xi., p. 159, and it also appeared on the title-page of the volume ending in 1906.

N. glaucina var. **lactea** Jeff.—Alderney (Marquand)!

N. affinis Gmel.—Off the Butt of Lewis, 545f. (Simpson)!

Adeorbis subcarinatus var. **interrupta** Marsh.—Achil Island.

Cerithiopsis barleei Jeff.—Off the Tripoli coast 40-120f., and Adventure Bank 120f. (H.M.S. 'Shearwater')! Tangiers Bay 35f., and Adventure Bank 92f. ('Porcupine')!

A specimen of *Triforis bigemma* Watson, two specimens of *Pedicularia sicula* Swainson, and several examples of *Volutomitra grœnlandica*, have been dredged in the Atlantic off Ireland, in 550f., by the Irish Fishery Board.

Cassidaria tyrrhena Chem.—Ten specimens of this shell were exhibited at the Conchological Society's meeting at Manchester on May 12, 1915, from the collection of Mr. G. M. Morris, and stated to have been "dredged alive recently off the south-west coast of Ireland, in deep water, by Captain Applegate."

At the same meeting, and from the same source, five specimens of *Ranella gigantea* Lam. were exhibited, which were stated to have been "obtained in good condition," while another example was dredged in the same district by the Irish Fishery Board in 287-354f.

Buccinopsis striata Jeff.—Gwyn Jeffreys' detailed notes of this species are quoted in Journ. Malac., 1911, vol. xi., pp. 342-3, with a woodcut. Six specimens were dredged in the 'Porcupine' expedition of 1869 north of the Shetlands, in 345f. None of them contained the animal, and as the operculum is also unknown its generic position cannot be absolutely determined, but Mr. Sykes has nevertheless altered the name to *Buccinum oblitum*, because, he says, the name Jeffreys gave is already in use. But the name Jeffreys gave (and under which it was published) was *Buccinopsis striata*; his *Buccinum striatum* is only a MS. synonym, and the shell may belong to either genus.

I do not know how far Mr. Sykes' figure of the shell is correct, as I have never seen it, but that figure cannot be Jeffreys' type, as the latter is described as having "curved and flexuous longitudinal ribs," which are absent from the figure; and while Jeffreys gives it 5-6 whorls, the figure shows 3-4. The length also should be 1 in., instead of ¾ in. In its general aspect the shell is not unlike some of the forms of our common species *Purpura lapillus.*

Figures of **F. attenuatus** Jeff.[1] and **F. consimilis** Marsh.[2] well exhibit the difference in the embryonic whorls of these two allied species, although part of the bulbus apex of the latter has been broken by an accident since I described it[3]; otherwise they are very much alike.

A fine living specimen of **F. ebur** Mörch, from off the Butt of Lewis in 260f., is in the collection of Mr. Tomlin, an excellent figure of which well represents its facies.[4] I had already recorded its occurrence in the same district (ex Knight Errant), and it is one of our Crag fossils. A specimen has also been dredged in the Atlantic off Ireland, in 320-372f., by the Irish Fishery Board.

This brings to a close my series of Papers under the above title. The references to Parts I. to VI. were given at the beginning of Part VII.,[5] while those to Part VII. are as follows:—

Additions to "British Conchology," Part VII., *Journ. of Conch.*, vol. 13, 1911, nos. 6, 7, 8; 1912, nos. 10, 11; vol. 14, 1913, nos. 2, 3, 4; 1914, nos. 6, 7; 1915, no. 11; vol. 15, 1916, nos. 2, 3, 1917, nos. 6, 7.

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Helicella virgata (Da Costa) **in Wirral, Cheshire.**—In July last I obtained about half-a-dozen dead specimens of *Helicella virgata* on sand-dunes bordering the Birkenhead Road, Meols, Cheshire. I was unable to find living examples owing to the dryness of the weather. The specimens were old, recently dead, as some contained the dried-up animals. Mr. C. Oldham in his "Land and Freshwater Mollusca of Cheshire" (*Naturalist*, April, 1896, p. 118) cites an old record of this species for Hilbre Island (T. S. Marratt, *fide* Gregson, "Naturalist's Scrap-Book," p. 23), but says that he looked for the species in vain when at Hilbre in 1894. The Meols discovery appears to be the first record for the mainland.—J. WILFRID JACKSON (*Read before the Society*, Nov. 8th, 1916).

[Note added July 6th, 1917.—In July this year I found many living immature specimens of the above species in the Meols locality. I also discovered a number of shells of the same species in blown sand on the coast between West Kirby and Caldy, but no living examples were seen in this neighbourhood.—J.W.J.]

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[1] Sykes: Moll. 'Porcupine' Exp., Proc. Malac. Soc., 1911, vol. ix., p. 337 (woodcut).

[2] *Journ. of Conch.*, 1912, pl. 5, fig. 4.

[3] Notes on British Fusus, &c., Journ. Malac., 1902, vol. ix., p. 49.

[4] *Journ. of Conch.*, 1912, pl. 5, fig. 5.

[5] *Journ. of Conch.*, 1911, vol. 13, p. 179.

A REVISION OF THE SPECIES OF TEREBRA OCCURRING IN THE PERSIAN GULF, GULF OF OMAN, AND ARABIAN SEA, AS EVIDENCED IN THE COLLECTION FORMED BY MR. F. W. TOWNSEND, 1893-1914.

BY JAMES COSMO MELVILL, M.A., D.Sc., AND ROBERT STANDEN.

(Read before the Society, March 8th, 1916).

IT is nearly fifteen years since we published our first account of the Marine Gastropoda of the Persian Gulf, and naturally many species new to the district, or to science, have been more recently collected, many also found in new localities, and at different depths, and some curious variations have likewise occurred. Certain emendations and corrections have also, naturally, to be made, and accordingly a revision of certain of the genera becomes necessary.

The genus *Terebra* is one of the most admired and graceful of all the marine gastropoda; and though most of the Persian Gulf region treated of in our paper is outside the Tropic of Cancer, some of the larger and finer species are found, though perhaps not very commonly, while several smaller endemic species, mostly made known by the dredgings of Colonel, afterwards Sir Lewis, Pelly, K.C.B., and described but not figured by Mr. Edgar Smith in the Ann. and Mag. N.H., 1877, occur in local plenty.

This genus has been split up into various sections and subdivisions, which are referred to in another paper brought out by one of us simultaneously with this, but it seems to us that, with the exception of the sub-genus *Mazatlania* Dall (*Euryta* H. and Ad., *non* Gistel) that they are not very necessary, so great a family likeness prevails throughout the whole series of over two hundred recent species. Of these, about one-seventh, say thirty-five, occur in the region we are now considering; which we proceed to give in alphabetical order, with references to where a description or figure may be found; and giving additional localities where they have been dredged by one of the most careful observers and collectors of the day, Mr. Frederick W. Townsend. We are sorry to say he has now retired, so that the series brought home by him in 1914 will be the last trophies, we fear, for very many years to come from the Persian Gulf, Gulf of Oman, and Arabian Sea.

1.—**Terebra ambrosia** Melv.

T. ambrosia Melv., Proc. Malac. Soc., x., p. 250, pl. xi., fig. 10, 1912.

Hab.: M.C., Charbar, 5 fathoms, sand.

Slightly larger than the allied *T. cognata* Smith, the type measuring long., 16; lat., 4·50 mm. The purplish-plum colour is very characteristic. The spiral noduled band below the sutures is well marked, the body-whorl possessing a double row, the rest of the surface of the shell being closely transversely lirate.

2.—Terebra babylonia Lamk.

T. babylonia Lamk., Anim. Sans Vert., vol. vii., p. 287.
T. babylonia Kiener, Coq. Viv. *Terebra*, pl. xiv., fig. 35, 35a.
T. babylonia Reeve, Conch. Icon., xii., pl. 11, fig. 43 A, B, 1860.
T. babylonia Sowerby, Thes. Conch., I., p. 169, pl. 43, f. 67.

Hab.: P.G., Henjam Island, Muscat, 10 fathoms, sandy mud. Also not infrequent on the shores of the Gulf of Oman.

This elegant, attenuate species, with fulvous orange tinge, becoming more prominent on the body-whorl, while over all a pinkish coating tends to subdue the more glaring colours beneath, is, with its near ally *T. deshayesi* Reeve, one of the most refined of the genus. It is widely distributed throughout the Eastern Tropics.

3.—Terebra cærulescens Lamarck.

T. cærulescens Lamarck, Anim. Sans Vert., vii., p. 288.
T. cærulescens Kiener, Icon., t. 6, fig. 12 A—D.
T. cærulescens Reeve, Conch. Icon., xii., pl. 7, fig. 26 A, B, C, 1860.
T. cærulescens Hinds in Sowerby, Thes. Conch., I., p. 159, pl. 41, f. 5, 6, 15.
Impages cærulescens Smith, Ann. and Mag. N.H., xi., 1873, p. 263.

Hab.: P.G., Gulf of Oman, Maskat (Muscat) 10 fathoms, sandy mud. Jask beach at low tide; extending to the Mekran coast, and fairly general on the shores of Beluchistan. At Charbar a large and handsome variety was obtained, 2·25 inches in length, well and notably marked upon a grey ground, with warm brown distinct longitudinal flames. Mr. Edgar Smith's definition of *Impages* is as follows: 'Shell subulate, whorls entire, more or less longitudinally striate or punctate, suture indistinctly separated, with a narrow callous band above it.' This equals the *Leiodomus* of Gray, non Swainson.

4.—Terebra capensis Smith.

T. (*Myurella*) *capensis* E. A. Smith, Ann. and Mag. N.H., xi., 1873, p. 269.
T. (*Myurella*) *capensis* Sowerby, Marine Shells of South Africa, 1892, p. 24, pl. iv., fig. 88.

Hab.: P.G., Henjam Island; Charbar. I., Karachi.

A small, rather insignificant species, considered a *Myurella* by its author, 16 mm. in length, longitudinally closely ribbed, smoothish, particularly as regards the base of the body-whorl. We have not seen specimens from this region, but understand that Mr. Smith confirmed the naming. Assuming this to be correct, a great extension of range is thus exhibited, for the type came from Port Elizabeth, South Africa.

It may possibly be a subspecies or variety of *T. nassoides* Hinds, which has never, however, been considered a *Myurella*, but more akin to *Mazatlania*.

5.—**Terebra cognata** Smith.

T. (*Myurella*) *cognata* E. A. Smith, Annals and Mag. N.H., xix., p. 229, 1877.

T. (*Myurella*) *cognata* E. A. Smith, Melvill and Standen, Moll. Persian Gulf, Proc. Zool. Soc., London, 1901, part i., p. 428, pl. xxi., fig. 9.

Hab.: P.G., Henjam Island. M.C., Charbar, 3 fathoms, sandy mud. I. Karachi, 3 to 7 fathoms, soft muddy bottom.

A small species, attaining 14 mm. in length, many ribbed and with coarse spiral striation. Considered by its author of the section *Myurella*. Very nearly allied to *T. ambrosia* Melv., as already mentioned.

6.—**Terebra contracta** Smith.

T. (*Myurella*) *contracta* E. A. Smith, Ann. Mag. N.H., xi., p. 268, 1873.

Hab.: I., Karachi. In shoal water on muddy basis. The naming of this small species, also considered a *Myurella* by the author, was confirmed by him. It has only occurred once, and that in the early days of Mr. Townsend's collecting, in 1893-4.

7.—**Terebra cumingi** Deshayes.

T. cumingi G. P. Deshayes, *Journ. de Conch.*, 1857, p. 66, pl. iii., fig. 1.

T. cumingi „ Proc. Zool. Soc. London, p. 311, 1859.

T. cumingi „ Reeve, Conch. Icon., xii., pl. 8, fig. 29, 1860.

T. cumingi „ Tryon, Man. Conch., vii., p. 28, pl. 8, fig. 42, 1885.

Hab.: P.G., Muscat, 10 fathoms.

One of the most refined of the genus, pale in colour, finely sculptured and elaborately chased, the ridges below the sutures slightly swollen, closely spirally lirate, crossed by oblique longitudinal striæ. A fine specimen attains a length of nearly 4 inches. Originally described from China.

8.—**Terebra duplicata** (Linné).

Buccinum duplicatum Linnæus, Syst. Nat., p. 1206.

T. chalybæus Martini, Conch. Cab.

T. duplicata (Linné), Reeve, Conch. Icon., xii., pl. i., fig. 3A, 3B., 1860.

T. duplicata (Linné), Hinds in Sowerby, Thes. Conch., I., p. 155, pl. 41, f. 1–4.

T. duplicata (Linné), Tryon, Man. Conch., vii., p. 17, pl. 4, figs. 49–51, 1885.

Hab.: P.G., on the telegraph cable young fresh specimens have often occurred. Muscat, 10–20 fathoms. M.C. Charbar, 3–8 fathoms on sand and mud.

Typical specimens of this very widely distributed and well known species. By some authors the var. *lamarcki* Kiener is considered specifically different; but with the exception of the conspicuous spiral row of spots on each whorl above the sutures and at the periphery of the body-whorl, which are not present in the type, I can see no difference whatsoever between them. This variety is well figured in Reeve, l.c., 3B.

9.—**Terebra edgarii** Melvill.

T. edgarii Melvill, Mem. and Proc. Manchester Lit. and Phil. Soc., 1898, vol. xlii., no. 4, p. 9, pl. 2, fig. 12.

T. edgarii Melvill and Standen, Proc Zool. Soc., London, 1901, part 1, p. 428.

Hab.: P.G., Henjam Island (a dark form). Basadu, Bunder Abbas. M.C., Astola Island, 9 fathoms. I., Karachi.

This species is near *evoluta* Desh., but is quite distinct, being broader in proportion towards the base, less shining, and with quite a different character of longitudinal ribbing, the costæ, particularly in the upper whorls, being far more frequent, and giving a marked character, by which it is almost at once distinguishable. The first specimens procured at Karachi are much more cinereous than the Bunder Abbas specimens, which are stramineous. It is a frequent species throughout the more northerly area. It was named in honour of Edgar A. Smith, of the British Museum (Natural History), than whom no one possesses a more intimate knowledge of the *Terebridæ*.[1]

10.—**Terebra evoluta** Desh.

T. evoluta G. P. Deshayes, Proc. Zool. Soc., London, 1859, p. 292.

T. evoluta „ Reeve, Conch. Icon., xii., 1860, pl. xiii., fig. 55.

T. evoluta „ Tryon, Man. Conch., vii., p. 16, pl. iii., fig. 47, 1885.

Hab.: P.G., near Koweit. I., Karachi.

Dwarfed specimens, but 15 mm. in length, if indeed they are to considered identical with the Japanese type, which measures 2·25 inches. But the character of the sculpture is the same, and some authors, *e.g.*, Tryon, merge this with the large *T. dussumieri* Kiener from Isle of Hainan, China, of which the type, figured in Coq. Viv. *Terebra*, pl. viii., fig. 17, measures 3·75 inches, and the very fine example of the Conch. Icon. (pl. ii., fig. 7) 4·25 inches. These little Persian Gulf examples are, compared with this, veritable pygmies.

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[1] This paper was read antecedent to the lamented death of Mr. E. A. Smith.

11.—**Terebra fuscobasis** Smith.

T. (*Myurella*) *fuscobasis* E. A. Smith, Ann. and Mag. N.H., 1877, xix., p. 227.

Hab.: P.G., Bunder Abbas, Persia (F.W.T.) "Persian Gulf," Col. Pelly in Mus. Brit. M.C., Charbar. I., Karachi.

A small, unfigured species, resembling the last in character of sculpture, but not so shining, broader proportionately basally. Our largest example measures but 15 mm. in length. A narrow pale reddish brown band encircles the lower whorls at a little distance below the sutures, the base being fuscous. But we have seen examples devoid of this character, from which the specific name was evidently derived. Under a lens of considerable power the interstices between the ribs are seen to be very finely striate. In *evoluta* they are quite smooth, and also in *edgarii*.

12.—**Terebra fuscocincta** Smith.

T. (*Myurella*) *fuscocincta* E. A. Smith, Ann. and Mag. N.H., 1877, xix., p. 228.

Hab.: P.G., Henjam Island (F.W.T.). "Persian Gulf," Col. Pelly in Mus. Brit.

A very small species, measuring 8 mm., somewhat shining, smooth, lightly longitudinally costate, costæ few, ornamented with a fuscous-red spiral line, a little below the sutures of each whorl, and also fuscous at the base of body-whorl. This and the last were the only two of the considerable number of *Terebræ* from this region described by Mr. Smith that we had not seen when, in 1901, our first catalogue was published.

13.—**Terebra gotoensis** Smith.

T. gotoensis E. A. Smith, Proc. Zool. Soc., London, 1879, p. 183, pl. xix., figs. 1 and 1A.

T. gotoensis E. A. Smith, Tryon, Man. Conch., vii., p. 23, pl. v., figs. 85, 91.

Hab.: I., Karachi, 3 to 7 fathoms, stones and mud.

The type, which came from Japan, is represented as having the spiral band unspotted. That is not the case with an undoubted example we possess from Aden. The sculpture is much the same as in *T. alveolata* Hinds (Conch. Icon., pl. xix., fig. 89), but the colour is cinereous, the spots yellow-brown. It has been merged with this species by Tryon. Type 37 mm., but the Aden example is only 30 mm. in length. *T. blanda* Desh., also from Japan, seems exceedingly close, and we should conjecture from the plate in Reeve, Conch. Icon., fig. 117, it might be identical.

14.—**Terebra helichrysum** Melv. and Stand.

T. helichrysum Melv. and Stand., Ann. and Mag. N.H., 1903, ser. vii., vol. xii., p. 310, pl. xxii., fig. 14.

Hab.: P.G., Mussandam, 47 to 55 fathoms. Muscat, 30 fathoms.

A handsome species, allied closely to the last (*gotoensis*) and to *alveolata* Hinds. From this it differs in the character of the longitudinal riblets, which are fewer in number in *helichrysum*, so that the interstitial spaces are broader than long, the same pitting being observable that there is in both the other species. The colour is a brighter stramineous, or rather, ochreous, than obtains in its congeners, and it seems a handsome addition to the genus. Our largest specimen measures 25 mm. *T. marmorata* Desh., a North Australian species, seems also comparable.

15.—**Terebra lepida** Hinds.

T. lepida Hinds, Proc. Zool. Soc. London, 1843, p. 158.
T. lepida „ in Sowerby, Thes. Conch., i., p. 182, pl. 45, f. 102.
T. lepida „ Reeve, Conch. Icon., xii., pl. 20, fig. 96, 1860.
T. lepida Tryon, Man. Conch., vii., p. 33, pl. x., fig. 88.

Hab.: P.G., Gulf of Oman, Maskat (Muscat) 10 fath., sandy mud. Charbar, 5 fathoms.

Tryon merges this with *T. strigilata* (L.), and it must be confessed much similarity exists; the smoothness and impressed character of the ribs are identical. *T. strigilata* also occurs in the Persian Gulf region not uncommonly.

16.—**Terebra macandrewi** Smith.

T. macandrewi E. A. Smith, Ann. and Mag. N.H., 1873, xi., p. 267.

T. macandrewi E. A. Smith, Melv. and Stand., Proc. Zool. Soc., London, 1901, part i., p. 428, pl. xxi., fig. 6.

Hab.: P.G., Col. Pelly in Mus. Brit. M.C., Charbar, in 3-5 fathoms, mud.

Described originally from specimens in the British Museum, dredged many years ago by Col. (afterwards Sir) Lewis Pelly, K.C.B., and presented by Mr. Macandrew. This is one of the most engaging little species possible. At the request of Mr. Smith we figured it in our paper, reference to which is given above. It is somewhat broad, slightly swollen below the sutures, spiral sulcus well defined, many ribbed, costæ straight, rather incrassate, painted pale fawn colour, at first whitish below the sutures, followed by a deep indigo narrow band, and in the centre of each whorl a circle of reddish spots, arranged as a band. Measurement of the largest example we have seen 20 mm., but the usual size is 15 mm. longitudinally.

17.—**Terebra nana** Deshayes.

T. nana G. P. Deshayes, Proc. Zool. Soc. Lond., 1859, p. 291.

T. nana G. P. Desh., Reeve, Conch. Icon., 1860, pl. xxvi., fig. 138.

Hab.: P.G., Jask, Henjam Island, Basadu. I., Karachi, 3 fathoms, among mud and stones.

A small, shining shell, almost smooth as regards the lower whorls, closely ribbed in the upper, palest straw colour, sometimes spirally red spotted centrally. It seems near *T. capensis* Smith.

18.—**Terebra nitida** Hinds.

T. nitida R. B. Hinds, Proc. Zool. Soc. London, 1843, p. 152.

T. nitida „ Reeve, Conch. Icon., xii., pl. xxii., fig. 115, 1860.

T. nitida „ Hinds in Sowerby, Thes. Conch., i., 164.

T. nitida „ Melvill and Sykes, Proc. Malac. Soc., iii., p. 43, pl. iii., fig. 8.

Hab.: P.G., Henjam Island.

One example only. It differs from *T. lepida* Hinds in its depressed spiral sulcus a little way below the sutures, punctate at each interstice. It measures over 1½ inch in length, is very smooth, and the ribs are of the same character as the species just mentioned and its near ally *T. strigilata* (L.).

19.—**Terebra pellyi** Smith.

T. pellyi E. A. Smith, Ann. and Mag. N.H., 1877, xix., p. 226.

T. pellyi E. A. Smith, Melvill and Standen, Proc. Zool. Soc., London, 1901, part 1, p. 428, pl. xxi., fig. 10.

Hab.: P.G., Galig Island, Jask. "Persian Gulf," Col. Pelly in Mus. Brit. M.C., Charbar. I., Karachi, 3 to 7 fathoms, mud and stones.

Another small species, attaining 15 mm. only in length, endemic in this region. Cinereous, many ribbed, spiral sulcus distinct, and crossed by many close striæ; a resemblance exists to *T. cognata* Sm. and *T. ambrosia* Melv., but the whorls are straighter and form more compact, there being not much sutural impression.

20.—**Terebra persica** Smith.

T. persica E. A. Smith, Ann. and Mag. N.H., 1877, xix., p. 225.

Hab.: P.G. and M.C. Locally distributed and nowhere common along the coast. "Persian Gulf," Col. Pelly in Mus. Brit.

Of this species we have seen but few specimens. In characters of sculpture some affinity with *T. edgarii* exists, but it is far more gradually attenuate than that species, and much narrower at the base. Mouth likewise smaller, and colour and general appearance altogether different. The raised band beneath the sutures is conspicuously noduled, and the whole surface closely spirally striate. Length about 15 mm.

21.—**Terebra remanalva** Melvill.

T. remanalva Melvill, Ann. and Mag. N.H., ser. 8, vol. vi., 1910, p. 12, pl. ii., fig. 21.

Hab.: P.G., Henjam Island. M.C., Gwadûr. Charbar, 5 fathoms. I., Karachi.

Near *T. spectabilis* Hinds, but the whorls are not so depressed at the sutures, and the ribs are fewer in number. The surface is microscopically very finely striate.

22.—**Terebra serotina** Adams and Reeve.

T. serotina Adams and Reeve, Moll. Voy. 'Samarang,' p. 30, pl. x., fig. 20.

T. serotina Reeve, Conch. Icon., xii., pl. xv., fig. 66, 1860.

T. „ Tryon, Man. Conch., vii., p. 29, pl. viii., fig. 53, 1885.

Hab.: I., Karachi.

A moderately sized shell as a rule, though occasionally reaching a length of two inches. Described originally from Japan,[1] and found by Sir E. Belcher, R.N. It has very much the same kind of sculpture as the much brighter coloured and larger *T. triseriata* Gray, alluded to below; the double row of nodules, the upper being the larger, just below the sutures in each whorl, is similar, but there is not so much decussation, the spiral striæ below being very pronounced and uninterrupted. Colour dull brown.

23.—**Terebra severa** Melvill.

T. severa Melvill, Mem. and Proc. Manchester Lit. and Phil. Soc., 1897, no. 7, p. 9, pl. vi., fig. 8.

Hab.: M.C., without precise locality. I., Karachi.

A small (15 mm.) rudely plaited shell, longitudinal ribs few, spiral strong liræ, three in number, noduled at the points of junction with the costæ; apex vitreous, bulbous, nodules on the uppermost whorls very strong and pronounced; sutures fairly impressed. Colour greyish-stramineous, base of body-whorl suffused with darker brown occasionally.

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[1] Our remark that the type came from Philippine Islands (Cuming Collection) in Proc. Zool. Soc., 1901, part 1, p. 429, was erroneous.

A rare species, of which we have not seen many examples; but one of the most distinct of this endemic group, both in form, sculpture, and coloration.

24.—**Terebra strigilata** (L.).

Buccinum strigilatum Linnæus, Syst. Nat., p. 1206, no. 484.
T. striatula Kiener, Coq. Viv., pl. ix., fig. 18.
T. striatula Hinds, in Sowerby, Thes. Conch., i., 186.
T. striatula Reeve, Conch. Icon., xii., pl. xviii., f. 85, 1860.
T. striatula Tryon, Man. Conch., vii., p. 33, pl. x., fig. 84, 1885.

Hab.: P.G., Muscat, dredged alive (F.W.T.). I., Karachi, not common, dead specimens only.

Linnæus described this well known species in the following terse language—"*Buccinum testa turrita, anfractibus bifidis obliquè striatis.*" Hanley ("Ipsa Linnæi Conchylia," p. 261), shows the difficulty experienced in identifying the Linnéan shell; indeed, he says, that had it not been for Born, who subsequently did produce a recognisable figure, it would have been impossible to retain the name "*strigilatum*" as corresponding to any then known *Terebra*.

It varies much in size. We have specimens from 20 to 45 mm. in length. It is of wide distribution, extending virtually over the whole eastern tropical area, including Polynesia. Tryon includes with it many so-called species, but we think he is too sweeping in his proposed agglomerations.

25.—**Terebra tantilla** Smith.

T. tantilla E. A. Smith, Ann. and Mag. N.H., 1873, xi., p. 270.

Hab.: P.G., Henjam Island. I., Karachi, 3 fathoms, muddy stone bottom.

Very small (8 mm.), but of beautiful sculpture, resembling in extreme miniature such a species as *spectabilis* Hinds. Beneath the sutures, the longitudinal ribs, as far as the spiral sulcus, are inconspicuously noduled. The whole surface is finely striate, and towards the base at the mouth entrance and over the columellar area there exists, in some specimens, a pale brown suffusion.

26.—**Terebra tenera** Hinds.

T. tenera Hinds, Proc. Zool. Soc., London, 1843, p. 158.
„ Hinds, in Sowerby, Thes. Conch., i., p. 184, pl. 45, f. 111.
„ Hinds, Reeve, Conch. Icon., xii., pl. 27, fig. 148, 1860.
„ Hinds, Tryon, Man. Conch., vii., p. 35, pl. x., fig. 99.

Hab.: P.G., Galig Island, Henjam Island, Bushire. M.C., Charbar. I., Bombay, Râtnagiri (A. Abercrombie and Col. H. D. Olivier).

A highly polished little shell (13 mm.) when in fresh condition; longitudinal costulæ very lightly impressed with dark brown narrow fasciæ beneath the sutures, and often regularly spirally brown spotted at the interstices between the ribs in the centre of each whorl. The body-whorl is thrice banded.

Dr. R. Brinsley Hinds described it originally as from Ceylon and Malacca coast. It is probably of wide distribution. It belongs to the section *Abretia* H. and A. Ad. (Gen. Rec. Moll., i., 225, 1853).

27—**Terebra trailli** Deshayes.

T. trailli G. P. Deshayes, Proc. Zool. Soc., London, 1859, p. 285.
T. trailli ,, Reeve, Conch. Icon., xii., pl. xxvi., fig. 142.
Hab.: Bombay.

This has not been recorded either by Mr. Townsend or Mr. A. Abercrombie, but we have received specimens from another source from this locality. It is peculiar to the Indian region; the first examples are recorded from Vizagapatam. Reeve describes it as most nearly allied to *T. cuspidata* Hinds, an elegant smooth lightly coloured shell from Cape Coast Castle, West Africa. The two examples in J.C.M.'s collection are 25 mm. long, elegantly attenuate, subulate, very smooth, the riblets becoming slight longitudinal straight waves, 'crenuled,' as the author of the Conch. Icon. expresses it; pale straw colour, once banded with pale indigo, base by the canal dark brown.

28.—**Terebra tricincta** Smith.

T. tricincta E. A. Smith, Ann. and Mag. N.H., 1877, xix., p. 225.

Hab.: P.G.. Henjam Island, rare. Bushire. I., Karachi, once dredged. Ratnagiri.

A species of about 15 mm. length, very nearly akin to *T. persica* of the same author.

29.—**Terebra tricolor** Sowerby.

T. tricolor Sowerby, Tankerville Catalogue Appendix, p. 24.
T. tricolor Reeve, Conch. Icon., xii., pl. 13, fig. 57.
T. tæniolata Quoy, Voy. de l'Astrolabe, p. 466, t. 36, figs. 25, 26.
Hab.: I., Karachi.

A fine example from this place, accidentally omitted from the record in our first paper. Originally from the Friendly Islands, it is found to be widely distributed, and pretty frequent in the Eastern Archipelago, Flores, etc. (Siboga Expedition). We recorded it from Lifu, but no specimen exists to confirm our record; and it may have been inadvertently mixed up with the similarly coloured *pygmæa* Hinds.

30.—Terebra triseriata Gray.

T. triseriata J. E. Gray, Proc. Zool. Soc., London, 1834, p. 61.

T. triseriata Reeve, Conch. Icon., xii., pl. xiii., fig. 52, 1860.

T. triseriata Hinds, in Sowerby, Thes. Conch., i., p. 171, pl. 45, f. 119.

T. triseriata Tryon, Man. Conch., vii., p. 30, pl. ix., figs. 56, 57, 1885.

Hab.: I., Bombay, once only (Capt. A. J. Peile).

This, the most gracefully attenuate of all the *Terebræ*, and sometimes attaining a length of over four inches (in the var. *prælonga* Desh., *vide* Reeve, pl. viii., fig. 28), is never found very commonly, though evidently widely distributed, extending from Indian Seas to Australia, and northward to the Philippine Isles. A specimen in the collection of J.C.M. has thirty-eight whorls, tapering gradually to a point, and this is by no means an exceedingly large example. The colour is bright ochreous, or fulvous-orange, whorls narrow, granuled and noduled decussately, with two rows of nodules above; the aperture is very small, columella tortuous.

31.—Terebra trismacaria Melvill.

T. trismacaria Melvill, *J. of Conch.*, vol. xv., p. 188, 1917.

Hab.: M.C., probably off Charbar, in the same dredging as *T. violascens* Hinds.

32.—Terebra undulata Gray.

T. undulata J. E. Gray, Proc. Zool. Soc., London, 1834, p. 60.
„ Hinds, in Sowerby, Thes. Conch., i., p. 172, pl. 43, f. 55.
„ Reeve, Conch. Icon., xii., pl. xviii., figs. 83, 84, 1860.
„ Tryon, Man. Conch., vii., p. 23, pl. vi., figs. 4, 8.

Hab.: I., Bombay and Ratnagiri (A. Abercrombie and A. J. Peile); Karachi, Mus. Brit., as *T. cinctella* Desh.

The type of this shell is a handsome, moderately-sized shell, orange, with white band between the sutures and the spiral sulcus, many ribbed, ribs undulate, a pricked groove dividing them at the upper part, interstices also pricked, columella straight. The type came from Philippine Isles (H. Cuming in Mus. Brit.).

33.—Terebra violascens Hinds.

T. violascens Hinds, Proc. Zool. Soc., London, 1843, p. 154.
„ Reeve, Conch. Icon., vol. xii., 1860, pl. xxiv., fig. 125.
„ Sowerby, Thes. Conch., vol. i., 1847, p. 177, pl. xlv., fig. 98.

Hab.: Probably off Charbar, but not precisely specified.

A pure white shell, sometimes with pale stramineous tinge, graceful in form, moderate in size, whorls slightly ventricose, seventeen in number, including the three nuclear, which are vitreous and very smooth; the rest are uniformly and elegantly costulate, with close, acute, somewhat flexuose ribs, uninterruptedly running longitudinally from suture to suture, and crossed by closely-arranged lirations of two kinds, the finely linear alternating with those of double the width. This species occurred extremely rarely.

34.—Terebra (Mazatlania) nassoides Hinds.

T. nassoides Hinds, Proc. Zool. Soc., London, 1843, p. 158.

T. nassoides Reeve, Conch. Icon., xii., pl. xxvi., fig. 144, 1860.

T. (Euryta) nassoides Tryon, Man. Conch., p.. 38, pl xii., fig. 23, 1885.

Hab.: P.G., Henjam Island, Jask, and other places on the Gulf of Oman. M.C., Charbar, very general everywhere.

A remarkably pretty small species, sometimes of an ivory whiteness, at others straw-coloured excepting below the sutures where white prevails, and ornamented with a median band of brown spots, with a dark spiral band at the entrance to the mouth; above, the riblets are more conspicuous and frequent.

Euryta H. and A. Adams, 1853, being pre-occupied, Dr. W. H. Dall has changed the name of the sub-genus to *Mazatlania*.

35.—Terebra (Mazatlania) thyræa Melvill.

T. (Euryta) thyræa Melvill, Mem. and Proc. Manchester Lit. and Phil. Soc., vol. xli., part iii., p. 10, pl. vi., fig. 13, 1897.

T. (Euryta) thyræa Melvill and Standen, Proc. Zool. Soc., London, 1901, part 1, p. 429.

Hab.: P.G., Koweit (a much attenuate form). M.C., Charbar, 5 fathoms, sand. I., Karachi, among loose stones and sandy mud, 3–5 fathoms.

We quote from the remarks appended to the original Latin description.

Long., 12 mm.; lat., 3·4 mm.

This is a very elegant, chaste species, and quite an outlying form of the genus, being most allied to *T. (Euryta) brazieri* Angas from Australia and *T. pulchella* A. Ad. It is almost an *Olivella* in shape, graceful, attenuate, white, with interrupted brown banding or spotting, eight-whorled, two (apical) being transparent, the remainder obscurely longitudinally obliquely ribbed, and irregularly sulculose; aperture straight, narrow, outer lip simple, columella straight. The name is derived from *θυραῖος*, outside, from its characters when compared to the majority of the genus.

N.B.—We are uncertain whether the true *T. polygyrata* Desh. is found in this region. An authenticated specimen received by J.C.M.

from the late Mr. G. Booley, who collected much in the Andaman Islands,[1] differs from those specimens we had deemed to be *polygyrata*. Accordingly, we omit the name at present.

Where is the Male of Paludestrina jenkinsi?—It is fifteen years since F. Taylor, after cleaning out more than three hundred specimens, and finding that all contained young, asked "What becomes of the males?" (this *Journal*, vol. ix., (1900) p. 340), but, as far as I know, the answer has not yet been given. C. Oldham (*ibid.*, vol. x. (1901) p. 42) records the same experience. In September, 1915, I met with the species in a pond in Hertfordshire, near Elstree, and having found fry in about one hundred consecutive specimens, searched systematically for males. In December no *jenkinsi* could be found, and in March only a few, but in June, July, and September, 1916, they were fairly abundant again, and had evidently bred, as on the last occasion the majority were quite juvenile. The large specimens always contained young, more or less developed; among the smaller ones there are, of course, a good many without obvious fry, but after examining in more or less detail some three hundred specimens I have been unable to find a male or hermaphrodite individual. All the specimens were of the plain, noncarinate form. If the species is really parthenogenetic the matter is worth attention; perhaps someone else can solve the difficulty. The condition is possibly found only in fresh water. May I also suggest that notice should be taken of the persistence of this species in any given locality; there seems to be some evidence that it is prone to die away after a few years, and such disappearances may be connected with its mode of reproduction. One is reminded of *Elodea*.—A. E. BOYCOTT (*Read before the Society*, November 8th, 1916).

Hibernation of Succinea elegans Risso.—I was surprised to find a number of immature *S. elegans* hibernating under bark of a dead willow, some four or five feet from the ground, in a swampy part of Minehead Warren. They were associated with *Clausilia bidentata* and *Pupa cylindracea*, rather an unusual gathering. —N. G. HADDEN (*Read before the Society*, June 13th, 1917).

Lienardia mighelsi nom. nov. — We propose this name for the Sandwich Island shell named *Pleurotoma rugosa* by Mighels, Proc. Boston Soc. Nat. Hist., vol. ii., p. 23, 1845, as the name is doubly invalid, having been twice used for fossils—by I. Lea, Contrib. to Geol., 1833, p. 136, pl. 4, f. 130; and by Deshayes, Descr. Coq. Fossiles Env. Paris, vol. ii., Moll., p. 486, 1834. As a variety Bouge and Dautzenberg (p. 188) class the shell named by G. and H. Nevill *curculio*. They gave the reference as "*Clathurella rugosa* var. *curculio* G. and H. Nevill, Journ. Asiat. Soc. Bengal, 1875, p. 86." It should be "*Pleurotoma curculio* G. and H. Nevill, Journ. Ceylon Branch Royal Asiatic Society 1867-70, pt. i., p. 142, 1870: Balapitiya, Ceylon." We do not consider this varietal at the present time, but we hope later to study authentic material. We have provided the above name as it may be years before the complex problems surrounding these small Turrids are worked out, and in the meantime a name is necessary for this common Indo-Pacific shell.—T. IREDALE and J. R. LE B. TOMLIN (*Read before the Society*, May 9th, 1917).

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[1] Melvill and Sykes: Marine Shells from the Andamans, II. Proc. Malac Soc., vol. iii., p. 42, where *polygyrata* Desh. is reported from the Philippine Isles and Japan. Twenty-two *Terebræ* are enumerated from the Booley Collections; of these only *babylonia*, *cærulescens*, and *nitida* occur in the Persian Gulf region, unless indeed *serotina* be considered a variety of *straminea* Gray. This last occurs in the Andamanese group.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

459th Meeting, held at the Manchester Museum, Feb. 14th, 1917.

Mr. E. Collier in the chair.

Additions to the Library announced and thanks voted:

"Wodarch's Introduction to the Study of Conchology" (3rd Ed., 1825), by J. Mawe (*presented by Lt.-Col. W. H. Turton*).

"Mollusks from the type locality of the Choctawhatchee Marl," by W. C. Mansfield.

"The Californian Land Shells of the Epiphragmophora traskii group," by Paul Bartsch.

"A New Mollusk of the Genus *Pisidium* from Alaska, with Field Notes by G. Dallas Hanna," by V. Sterki.

"Diagnoses of New Species of Marine Bivalve Mollusks from the Northwest Coast of America in the collection of the United States National Museum," by W. H. Dall.

"A Contribution to the Invertebrate Fauna of the Oligocene Beds of the Flint River, Georgia," by W. H. Dall.

"Manual of Conchology," part 93, by H. A. Pilsbry.

"Note on some Holocene Marine Shells from the Aran Isles, co. Galway," by J. R. le B. Tomlin.

"Note on the *Erato guttula* of Sowerby and on *Marginella schepmani*, n.n. for *M. abyssicola* Schepman," by J. R. le B. Tomlin (*from the respective authors*); and the usual periodicals received in exchange.

Donations to the Cabinet announced and thanks voted:

By Mr. Chas. Oldham: *Helicella itala* var. *minor*, Studham, Beds.; *Jaminia secale*, Harefield, Middlesex; *Vertigo antivertigo*, Morfa Dyffryn, Llaneuddwyn, Merionethshire; *Paludestrina jenkinsi*, Arthog, Merionethshire; *Unio pictorum*, elongated specimen, 45 × 111 mm., canal, Deanshanger, Northants.

New Member Elected.

W. James Wintle, F.Z.S.

Candidate Proposed for Membership.

Duncan Keogh, 13, Richmond Wood Road, Bournemouth (introduced by L. J. Shackleford and J. E. Cooper).

Resignations.

T. Bonner-Chambers.

G. L. Sturt (Rifle Brigade, India).

Killed in Action, August, 1916.

E. G. M. Sturt (Middlesex Regiment).

Papers Read.

"The Genitalia of *Azeca tridens* and *Cochlicopa lubrica*," by A. E. Boycott.

"*Pisidium hibernicum* in Carnarvonshire," by C. Oldham.

"*Pisidium lilljeborgi* in Carnarvonshire," by C. Oldham.

"Field Notes and Observations on *Helicodonta obvoluta*," by H. Beeston.

Exhibits.

By Mr. C. H. Moore: *Anodonta cygnea* from reservoir at Stalybridge.

By Mr. G. C. Spence: Shells from Wolverton, Bucks.

By Mrs. Gill: Series of *Natica*; and *Columbarium pagoda* from Japan.

By Mr. W. H. Davies: *Unio pictorum* from canal, Congleton.

By Mr. J. W. Jackson: Five pearls taken from one specimen of *Mytilus edulis*, the largest specimens measuring 4·3 × 4 and 6·7 × 4·7 mm.

By Mr. Chas. Oldham: *Helicella gigaxii* var. *alba* and var. *hyalozonata*, Deanshanger, Northants.; *Helix aspersa* var. *exalbida* and var. *rufulozonata*, Tring; *Helix hortensis* var. *lilacina*, Tring; *Helicella itala* var. *hyalozonata*, Aldbury Owers; *Sphærium corneum* var. *flavescens*, Llyn Padarn, Carnarvonshire; *Helicigona arbustorum* var. *fragilis* (of Wattebled *not* of Esmark), wet rocks at 2,000 feet in Cwm Idwal; *Limnæa pereger* var. *membranacea* Porro, Llyn Glas, Cwm Clogwyn, Snowdon, 1,740 feet; *Ancylus fluviatilis* and *Pisidium personatum*, Llyn Glas, Cwm Glas, Snowdon, 2,250 feet; *P. casertanum*, peaty pool in Cwm Clogwyn; *P. personatum*, Mochras Island. To illustrate notes: *Pisidium hibernicum*, Llyn Dwythwch, near Llanberis; *Pisidium lilljeborgi*, Marchlyn Bach, near Bethesda, and Llyn Peris.

In the Special Exhibit of the genus *Rhysota* many species were shown from the collections of Mr. E. Collier, Mrs. Gill, and the Manchester Museum, and an interesting discussion followed.

460th Meeting, held at the Manchester Museum, March 14th, 1917.

Mr. E. Collier in the chair.

Additions to the Library announced and thanks voted:

"Summary of the Mollusks of the Family Alectrionidæ of the West Coast of America," by W. H. Dall (*from the author*); and the usual periodicals received in exchange.

Donations to the Cabinet from Dr. R. F. Scharff were announced, and thanks voted.

New Member Elected.

Duncan Keogh.

Papers Read.

"The Value of Débris Sifting in collecting Minute Mollusca," by H. Beeston.

"Notes and Observations on the Non-marine Mollusca of Llandudno and district," by H. Beeston.

"*Photinula wacei*, sp. nov., from the Falkland Isles," by J. C. Melvill and R. Standen.

"The Clausium in *Alopia*, a sub-genus of *Clausilia*," by J. D. Dean.

Exhibits.

By Mrs. Gill: A large number of *Liparus*.

By Mr. E. Collier: A large series of *Alopia*.

By Mr. W. H. Davies: Species of *Chilostoma*; and local freshwater shells.

In the Special Exhibit of *Ariophanta* many species were shown by Mrs. Gill, Mr. E. Collier, and Mr. R. Standen.

It was decided to have the following Special Exhibits:—

April 11th	- -	The Genus *Obba*.
May 9th	- -	The Genus *Vitrina*.
June 13th	- -	The Genus *Helicarion*.

461st Meeting, held at the Manchester Museum, April 11th, 1917.

Mr. E. Collier in the chair.

Paper Read.

"On the Occurrence of *Planorbis dilatatus* and *Physa heterostropha* at Oldham," by F. Taylor.

Exhibits.

By Mrs. Gill: American Helices.

By Mr. W. H. Davies: Series of shells from Marple, Cheshire.

By Mr. F. Taylor: *Planorbis dilatatus* and *Physa heterostropha* from Oldham.

In the Special Exhibit, *Obba*, large series were shown by Mrs. Gill, Messrs. J. R. Hardy, E. Collier, G. C. Spence and the Manchester Museum, Mr. Hardy's collection being exceptionally fine.

462nd Meeting, held at the Manchester Museum, May 9th, 1917.

Mr. E. Collier in the chair.

Candidate Proposed for Membership.

Rev. Robert Marle, M.A., 77, Grove Street, Liverpool (proposed by J. M. Williams and R. Standen).

Member Deceased.

Rev. L. J. Shackleford.

A vote of condolence with Mrs. Shackleford and family was passed unanimously.

Papers Read.

"Obituary Notice: Rev. L. J. Shackleford," by R. Standen.

"Obituary Notice: J. H. Ponsonby-Fane," by J. C. Melvill.

"*Otina otis* at St. Mary's, Scilly," by J. C. Melvill.

"*Lienardia mighelsi* nom. nov.," by T. Iredale and J. R. le B. Tomlin.

Exhibits.

By Mr. F. Taylor: *Planorbis dilatatus* from Oldham.

By Mr. W. H. Davies: *H. arbustorum*, etc., from Marple.

By Mr. G. C. Spence: *Planispira* and allies.

By Mrs. Gill: *Sigaretus* and *Gena*.

By Mr. R. Standen: The collection of *Marginellidæ* bequeathed to the Manchester Museum by the late Rev. L. J. Shackleford.

In the Special Exhibit, *Vitrina*, shells were shown by Messrs. J. R. Hardy, R. Standen, E. Collier, C. H. Moore, Mrs. Gill, and the Manchester Museum (Darbishire Collection).

463rd Meeting, held at the Manchester Museum, June 13th, 1917.

Mr. E. Collier in the chair.

Additions to the Library announced and thanks voted:

Two papers by R. Bullen Newton (*from the author*).

Donations to the Cabinet announced and thanks voted:

Cochlicopa lubrica and aberration from Radlett, Herts. (from Rev. E. W. Bowell); *Anodonta cygnea* from Astley (from Mr. W. H. Davies).

Miss Shackleford also presented a photograph of her father, the Rev. L. J. Shackleford.

New Member Elected.

Rev. Robert Marle.

Candidates Proposed for Membership.

Harry Sowden, Micklegate Bar, York; and Joseph G. Kitchen, 19, Byrom Street, Altrincham (both introduced by J. W. Jackson and E. Collier).

Member Deceased.

Dr. H. F. Becker, F.L.S., F.S.A.

Papers Read.

"*Paludestrina jenkinsi* Smith in Bucks.," by J. E. Cooper.

"Hibernation of *Succinea elegans* Risso," by N. G. Hadden.

"*Testacella maugei* var. *viridans* Morelet at Porlock Weir," by N. G. Hadden.

"Note upon *Conus melvilli* Sowerby," by J. C. Melvill.

"Researches into the Hereditary Characters of some of our British Mollusca; part 2; *Helix aspersa* Müll. and *H. nemoralis* L.," by A. W. Stelfox.

Exhibits

Were made by Messrs. Coilier, Stelfox, Spence, Moore, Mrs. Gill, and the Manchester Museum.

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Notes on some North Devon Mollusca.—The following species and varieties of non-marine shells were obtained in July and August of the year 1915, and do not appear to have been recorded for their respective localities hitherto. *Vitrea cellaria* (Müll) var. *albina* Moq.-Tan. Fairly plentiful in the woods on the banks of the East Lyn river near Lynmouth. The type is abundant here, and attains a large size, but careful examination of a number of living examples failed to reveal var. *lucida* (Drap.) in the district. *Zonitoides excavatus* (Bean). A single specimen of the type form was obtained near Coombe Park Gate, and three more in the wettest part of Lee Woods, Lynton. *Helicella caperata* (Mont.) var. *ornata* Pic. Valley of the Rocks, Lynton. The type occurred in abundance on the top of a wall at Lee Bay. *Hygromia fusca* (Mont.) Woody Bay woods, not common. *Vallonia excentrica* Sterki. One example under a stone in a field near Sixacre Farm, Lynton. The only *Vallonia* obtained. *Helix aspersa* Müll. m. *subscalariforme*. One on a foxglove plant near Lynton. Although abundant in the district, the species showed little variation in colouration or banding. *Helix nemoralis* L. var. *fascialba* Pic. A large proportion of the shells were of this variety; a particularly fine colony on the roadside bank between Lynton and Woody Bay. *Clausilia laminata* (Mont.) var. *albina* Moq.-Tan. One specimen with the type in woods on bank of the East Lyn near Lynmouth. *Ancylus fluviatilis* Müll., var. *albida* Jeff. Very fine specimens in the upper reaches of the East Lyn river. *Limnæa pereger* (Müll.) var. *boissyi* Dupuy. Associated with the last species in the East Lyn river below Brendon. *L. pereger* (Müll.) var. *lacustrina* Stud. Plentiful in a swift-flowing stream at Leemouth, near Lynton. *L. pereger* (Müll.) var. *conglobata* Loc. Plentiful in a very shallow pool among the sand dunes at Braunton Burrows. The animal was very remarkable for the orange colouring of the foot. *L. pereger* (Müll.) var. *excerpta* Htm. Braunton Burrows, with the last form. *L. pereger* (Müll.) var. *ovata* Drap. Braunton Burrows with the last two forms. I am greatly indebted to Mr. J. W. Taylor for kindly naming the above varieties of *L. pereger* for me. I was pleased to find *Helicigona lapicida* var. *albina* Menke fairly plentiful on a wall in the Valley of the Rocks, along with the type and var. *subpellucida* Baudon. In all the woods *Limax arborum* Bouch.-Chant. and *Vitrea alliaria* (Mill.) were extremely abundant. *Agriolimax lævis* (Müll.) was fairly common in wet parts of the woods. The only species to be found in streams on Exmoor was *Ancylus fluviatilis* Müll., the district being very unsuitable for fresh-water mollusca. A very large form of *Limnæa truncatula* (Müll.) inhabits the wet rocks at Wringcliff Bay near Lynton, very little above high-tide line. They must be frequently washed by the spray from the waves.—NORMAN G. HADDEN (*Read before the Society*, Nov. 10th, 1915).

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OBITUARY NOTICE: DR. H. F. BECKER.

By THE EDITOR.

[For the following details we are indebted to *Grocott's Penny Mail*, a Grahamstown newspaper].

HERMANN Francis Becker died at Grahamstown, South Africa, on April 4th last, on his seventy-ninth birthday. He had been a member of our Society for the last twelve years, and was an indefatigable and successful collector of South African mollusca, especially marine forms.

He took his degree in medicine at the University of Jena, in 1862, and after residing for a time in Cornwall went to the Cape in 1868 to take up the post of District-Surgeon at Port Alfred.

In 1874 he removed to Grahamstown, and built up a very successful private practice. Having considerable artistic tastes and sympathies he was a strong supporter of the art school and of local art in general, and it was through his instrumentality that the Grahamstown Fine Arts Association was established in 1901 under his presidency—a post he continued to hold till his death.

In 1886 he was elected to the medical staff of the Albany General Hospital, and held the office of visiting medical officer for twenty-seven years consecutively, and for a year that of consulting physician.

He resigned in 1913, and the hospital report for that year emphasizes the services which he repeatedly rendered to the out-patient department, and the value of his expert knowledge of botany, forestry, helminthology, and other branches of natural history.

For thirty years he served on the Albany Museum Committee, part of the time as its chairman.

He was a Fellow of the Linnean Society and of the Society of Arts, and a member of the S. John's Lodge of Freemasons, Grahamstown. He leaves a widow and one daughter.

Though an ardent conchologist, he never, as far as we are aware, wrote on the subject. Mr. Sowerby described some of his discoveries in vol. iv. of the Proceedings of the Malacological Society, pp. 1–7, 213–215, and named an *Amphiperas*, a *Columbella*, a *Gibbula*, and a *Solariella* after him.

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New Name for Microsetia (preoccupied).—This generic name, proposed by Monterosato in his Nomencl. Gen. e Spec., p. 74 (1884) for certain Rissoids, is preoccupied by Stephens in Lepidoptera, Cat. Brit. Ins., ii., 207, spp. 7329–54 (1829). The name has been applied to Mediterranean and to Cape species. I now propose the new generic name *Coriandria* for the shell I described as *Microsetia durbanensis* (*J. of C.*, xv., 119).—J. R. LE B. TOMLIN.

Note on Conus melvilli Sowerby.—This curious little species was described in the Proc. Zool. Soc., London, 1878, p. 795, from an unique specimen, and also figured, and the locality given as picked up by myself on the south beach of Key West (Cayo Hueso or Bone Key) in March, 1872. This shell has not been recognised since as occurring in the above locality, and some few years ago I had a correspondence with Dr. W. H. Dall on the subject, and promised him to place my impressions on record for publication. I was but a beginner in the study of the mollusca in the early seventies, and during the spring and summer of 1873, just after my return home from spending the best part of a year in the United States, the great collections amassed by the late Mr. T. Norris of Preston were advertised for sale at Stevens'. I purchased a considerable number of lots, including one of small Cones, some of which I sent up to Mr. Sowerby, and at the same time I forwarded him a good many species I had gathered on the Florida and other shores of the Southern United States. My strong impression for several years has been, and still is, that this Cone really came from this lot (no. 248 in the second day's sale of the Norris Collection, June 6, 1873) and had somehow been mingled with Cones I had gathered myself, *e.g.*, *C. pusio*, *C. columba*, and *C. floridensis*, and that the place of its nativity is still, therefore, unknown. It was figured by Sowerby, Thes. Conch. Supplement, ii., Conus, p. 249, pl. xxix. (Thes., pl. 507), fig. 653. I have really little doubt but that this is the true solution of the matter. I certainly have no recollection of having picked up the shells myself, but Mr. Sowerby assured me it came to him with the other species from the Florida Keys. Anyhow, this correction does not invalidate the species. The regular close spiral brown lines, encircling the whole surface, seem one of its most characteristic features; and I do not know a near ally, though I should not be surprised if it were eventually allotted a place near the group of *C. adansonii*.—J. C. MELVILL (*Read before the Society*, June 13th, 1917).

Hygromia revelata in North Devon.—The finding of this species during June last in considerable numbers amongst tufts of Sea Campion (*Silene maritima* D.C.) on the cliffs within a mile of Ilfracombe, by Mr. Cecil P. Hurst, is interesting, and a great extension of its range on the mainland. A few years ago Mr. Tomlin found the species plentifully on Lundy Island, but prior to Mr. Hurst's discovery *H. revelata* was not known to exist on the mainland east of Newquay in East Cornwall. It will probably be found to extend along the coast in suitable places.—JOHN W. TAYLOR.

Hygromia revelata in North Devon.—Mr. Taylor's note reminds me that this species was sent me last year in numbers from the neighbourhood of Hartland Point.—J. R. LE B. TOMLIN.

Hygromia striolata in Notts.—The discovery of this species at Worksop and Newark, Nottinghamshire, by the diligence and enthusiasm of Mr. T. H. Chambers, of Leeds, fills up an important blank in the area inhabited by this species. This inexplicable total absence of *H. striolata* from Nottinghamshire, though an inhabitant of every other English county, was so remarkable that it was especially commented upon in the recently issued Part xxii. of the Monograph of the Mollusca, where this species is treated upon.—JOHN W. TAYLOR.

CENSUS AUTHENTICATIONS.

By W. DENISON ROEBUCK, M.Sc., F.L.S., Hon. Recorder.

All the records here given are based upon examples submitted to the official authenticators; myself for slugs only; Mr. F. Taylor for *Paludestrinidæ*; and Mr. John W. Taylor for all other species. C.S.V. Coll. = Conchological Society's Voucher Collection.

Records needed from divided Irish Vice-Counties.—Hitherto the records have been for Donegal, Galway East, Kerry, Cork North, and Cork South. Mr. Praeger's subdivisions of these having been adopted, it is needful that further records be submitted for Donegal East, Donegal West, Galway North-East, Galway South-East, Kerry North, Kerry South, Cork North-East, Cork North-Mid, Cork North-West, Cork South-West, and Cork South-Mid. It may be explained as to Cork County that the acceptance of Mr. Praeger's three-fold division into East, Mid, and West does not in the least mean the abandonment of the old two-fold division into Cork North and Cork South. The new lines simply cut across the old ones, and the records needed are therefore for five vice-counties, none too many for so large an area as Cork County.

1 **Cornwall West**: *Phytia myosotis* and *Ovatella bidentata* from Porthcurnow (E. D. Marquand).

3 **Devon South**: *Sphyradium edentulum* from Haldon Woods, near Exeter; and typical young *Limax arborum*, Totnes, 17th May, 1916 (E. D. Marquand).

6 **Somerset North**: *Hyalinia lucida*, Weston, one (J. D. Dean); *Sphyradium edentulum*, Weston-super-Mare (Id.).

7 **Wilts North**: Mr. Cecil P. Hurst has presented to the Voucher Collection *Hyalinia alliaria* found in Savernake Forest, 17th April, 1916; and *Vertigo antivertigo* found on wood floating in the Bedwyn Brook, near Froxfield. Mr. J. H. Adams has sent a few valves of *Anodonta cygnea*, *Pupa muscorum*, *Helix pomatia*, *Helicigona lapicida*, *Hygromia fusca*, *Vitrina pellucida*, *Zonitoides nitidus*, *Pupa secale*, and *Azeca tridens*, all from near Marlborough.

8 **Wilts South**: *Helicella heripensis*, Salisbury, one, coll. Edmondson (F. Booth, 1916).

20 **Hertfordshire**: Mr. Charles Oldham has submitted *Pisidium supinum* taken July 1909, in the Grand Junction Canal at Tring (C.S.V. Coll.). *Acroloxus lacustris* from Northchurch Common.

34 **Gloucester West**: *Hyalinia helvetica*, English Bicknor, July, 1913, one (A. E. Boycott).

41 **Glamorgan**: *Zonitoides excavatus* var. *vitrina*, Glyn Neath, one (H. M. Hallett per J. D. Dean). Mr. H. M. Hallett has sent a half-grown *Limax flavus* var. *rufescens* taken at Penarth on 7th Dec., 1916.

44 **Carmarthenshire**: *Hygromia fusca*, Gwnyfail, several, ex H. Brooksbank, 19th Oct. 1907 (J. Kidson Taylor).

45 **Pembrokeshire**: *Vallonia excentrica* and *V. costata*, numerous, Holloway Quarry, Tenby, 1897, A. G. Stubbs (C.S.V. Coll.).

48 **Merionethshire**: Mr. Charles Oldham has submitted *Vertigo pygmæa*, taken at Fegla Fawr near Barmouth; a few small *Physa fontinalis* taken at Penmaenpool; and two *Pisidium cinereum* (*casertanum*) from Arthog, all found 9th Oct. 1916.

49 **Carnarvonshire**: *Hyalinia lucida*, Portmadoc, Aug., 1913, one, A. E. Boycott (C.S.V. Coll.).

51 **Flintshire**: Messrs. J. W. Jackson and R. Standen have submitted new records as follows:—*Hyalinia radiatula*, two, *Ancylus fluviatilis*, numerous, *Planorbis albus*, two, all from Graig Arthur, near Newmarket; *Aplexa hypnorum*, numerous, *Physa fontinalis*, several, and *Planorbis spirorbis* with var. *leucostoma*, numerous, all from ditches at Prestatyn; *Vallonia excentrica*, three from Gop near Newmarket; *Succinea elegans*, numerous, with one var. *albida*, from Prestatyn; *Limnæa palustris*, numerous in ditches by railway side west of Prestatyn Station; and *Planorbis crista* var. *lævigata*, numerous in ditch west of Prestatyn Station; *Helicella heripensis*, numerous on Prestatyn sand dunes; and *Balea perversa*, several at Newmarket; *Pisidium cinereum* (*casertanum* B.B.W.) numerous in a pond near the 'Miners' Rest,' south of Trelogan, Sept. 1913; *Sphærium lacustre*, a few in a pond near Trelogan, Sept. 1913; *Vertigo pygmæa*, numerous in quarries on hill-side behind Prestatyn, Sept. 1913.

58 **Cheshire**: *Helicella virgata* and var. *subdeleta*, Meols sand-dunes, July 1916, numerous (J. W. Jackson).

77 **Lanarkshire**: *Agriolimax lævis*, Possil Marsh, 10th Dec. 1916, a few (Wm. Rennie); *Limax flavus*, Cadder, one, 9th April 1917 (Id.); *Limnæa auricularia*, Glasgow, two (G. A. F. Knight); *Pupa cylindracea*, Blantyre, several (Id.); *Pisidium cinereum*, Possil (Id.); *P. henslowanum*, Kelvin, two (Id.).

88 **Perthshire Mid**: *Pisidium nitidum*, Loch Dochart (G. A. F. Knight).

90 **Forfarshire**: Rev. G. A. F. Knight has submitted *Vertigo pygmæa* and *Carychium minimum* from Broughty Ferry.

95 **Elginshire**: *Segmentina lineata*, Elginshire, Geo. Gordon (Elgin Museum). A notable addition to the authenticated fauna of Scotland. *Arion hortensis*, Duffus House, Elgin, 20th Feb. 1917 (William Ogg). *Agriolimax lævis*, Lesmurdie, 21st Feb. 1917 (H. B. Mackintosh).

99 **Dumbartonshire**: *Hyalinia radiatula*, one, Farlane Bay, Gareloch (G. A. F. Knight).

100 **Clyde Islands**: *Pisidium subtruncatum*, Iorsa Water, Arran, three (G. A. F. Knight).

103 **Ebudes Mid**: *Ancylus fluviatilis*, Island of Mull, several (G. A. F. Knight).

106 **Ross East**: In July 1910, Mr. J. W. Vaughan working from Strathpeffer submitted the following: In curling pool at Strathpeffer, a few *Limnæa pereger*, one *L. truncatula* and a few *Pisidium fontinale*; in small stream at Auchterneed, one *Ancylus fluviatilis*; at Garve, one *Hyalinia radiatula*; in Kinellan Loch, one *Limnæa palustris*, juv., and a few *Pisidium pulchellum*. *Arion intermedius*, young examples from Swordale, near Evanton, 7th June 1916 (Miss A. C. Jackson).

110 **Outer Hebrides**: *Hyalinia lucida*, one, and *Hygromia granulata*, two, Barra Island (G. A. F. Knight).

111 **Orkneys**: Mr. A. W. Stelfox has sent three *Hygromia hispida* (*concinna*) taken by him some years ago at Stromness, near the 'landing-place'; they are of var. *fusca*. Mr. Stelfox remarks that "they may have been imported from somewhere." This record is of interest from being so far north of the northern limit of the range of the species on the Scottish mainland, from Main Argyll to Kincardineshire.

122 **Co. Louth**: *Helicella itala* var. *lentiginosa*, Drogheda (F. H. Sikes).

148 N. **Kerry North**: *Hyalinia lucida*, one, 17th May 1915, Kenmare Gardens, Killarney (Greevz Fysher).

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1913. Gauntlett, H. L., M.R.C.S., L.R.C.P., A.K.C., 39, Oakhil
Putney, S.W. 15.
1911. Geiser, Samuel W., Upper Iowa University, Fayette, Iowa, U.S.
1887. Gerland, Conrad, M.Sc., Ph.D., F.C.S., Meadow Bank, Accringt
1917. Giffard, H. P. W., B.A., B.Sc., F.G.S., 103, Ebury St., London,
1908. Gill, Mrs. A. E., Dinant Cottage, 1, Claude Road, Chorlton-cum
1916. *L* Gladstone, John S., Nanhurst, Cranleigh, Surrey.
1886. *L* Godlee, Theo., Whips Cross, Walthamstow, Essex.
1906. Gomez, A. da Costa, 201, St. James' Place, Brooklyn, N.Y., U.S
1904. Gray, Arthur F., Exchange Building, 53, State St., Boston, Mass.
1904. Grierson, P. H., St. Kevins, Bray, co. Wicklow.
1890. Gude, G. K., F.Z.S., 9, Wimbledon Park Road, S.W. 18.
1907. Gyngell, Walter, 13, Gladstone Road, Scarborough.

1909. Haas, Dr. Fritz, Senckenbergisches Museum, Victoria Allee, 7, F
am-Main.
1910. Hadden, Norman G., Breezy Bank, West Porlock, Som.
1895. Hann, Rev. Adam, 842, Chester Road, Stretford, Manchester.
1895. Hardy, John Ray, The Museum, The University, Manchester.
1887. Hargreaves, J. A., 40, North Marine Road, Scarborough.
1913. Harman, A., 5, Harley Street, Scalby Road, Scarborough.
1909. Harrison, Richard, 79, Upper Duke Street, Hulme, Manchester.
1889. Hartley, Alfred, 19, Thorpe Garth, Idle, near Bradford, Yorks.
1887. Harvard, T. Mawson, 25, Sinclair Gardens, West Kensington, W
1907. Hawkins, H. L., University College, Reading.
1887. Heathcote, Wm. Henry, F.L.S., The Marsh, Longton, Preston,
1907. Henderson, J. B., jr., 16th Street and Florida Avenue, Washingto
U.S.A.
1913. Heller, Julius, Villa Gisela, Teplitz, Bohemia.
1887. Hey, Thomas, 98, Archer Road, Millhouses, Sheffield.
1895. Hibbert, Charles R. C., South Close, Landcross, Bideford, Devon.
1895. *P* Hickson, Prof. Sydney J., D.Sc., M.A., F.R.S., University, Man
1886. *L* Hillman, Thomas Stanton, Eastgate Street, Lewes, Sussex.
1907. Hindley, R. T., The Green Way, Macclesfield.
1906. Hirase, Y., Karasumaru, Kyoto, Japan.

1911. Hitchon, Mrs. Susan A., Rhyddington, Oswaldtwistle, Lancs.
1891.*P* Horsley, Rev. Canon J. W., M.A., Detling Vicarage, Maidstone.
1917. Horton-Smith, Dr. W., M.B., Ravenswood, Winnington, Northwich.
1907. Horwood, A. R., Leicester Museum and Art Galleries, Leicester.
1907. Howard, Vernon, Carlton Lodge, Eastgate, Louth.
1884. Howell, George O., 210, Eglinton Road, Plumstead, Kent.
1892. Howorth, Sir Henry Hoyle, K.C.I.E., M.P., F.R.S., etc., 45, Lexham Gardens, London, W. 8.
1886.*P* Hoyle, W. E., M.A., D.Sc., The National Museum of Wales, Cardiff.
1909. Huggins, Henry C., 17, Clarence Place, Gravesend.
1911. Humphreys, Griffith, 1, Belsize Avenue, London, N.W. 3.
1915. Hurst, C. P., Ivy House, Great Bedwyn, Hungerford.
1905. Hutton, W. Harrison, 44, Dial Street, Leeds.

1913.* Ingrams, Lieut. W. H., 7th The King's Shropshire Light Infantry, c/o G.P.O., London.

1901. Jackson, J. Wilfrid, F.G.S., The Museum, The University, Manchester.
1912. Jenkinson, Charles, Cliffe House, London Road, Kettering.
1891. Jenner, James Herbert Augustus, F.E.S., Eastgate House, Lewes.
1912.*L* Jewell, Miss F., Emsworth, Hants.
1906. Johnson, Chas. W., Boston Society of Natural History, Boston, Mass., U.S.A.
1908. Jolliffe, J. E. A., Foundation, St. Bees, Cumberland.
1894. Jones, Fleet-Surgeon K. H., M.B., Ch.B., F.Z.S., R.N., The Manor House, St. Stephen's, Canterbury.

1907. Kendall, Rev. C. E. Y., Oundle, Northants.
1897.*L* Kennard, A. S., Benenden, 161, Mackenzie Road, Beckenham, Kent.
1914. Kennedy, Lieut. J. Noble, M.C., Headquarters, 1st Anzac Heavy Artillery, B.E.F., France.
1902.*L* Kensett, Percy F., Broadmeadow, Coombe Lane, Wimbledon, S.W. 19.
1897. Kenyon, Mrs. Agnes Fleming, 291, Highett St., Richmond, Melbourne, Victoria.
1917. Keogh, Duncan, 13, Richmond Wood Road, Bournemouth.
1917. Kitchen, J. G., 19, Byrom Street, Altrincham, Cheshire.
1889. Knight, Rev. G. A. Frank, M.A., F.R.S.E., 52, Sardinia Terrace, Hillhead, Glasgow.

1901. Laidlaw, Dr. F. F., M.A., Hyefield, Uffculme, Cullompton, Devon.
1899. Lancaster, Ernest Le Cronier, B.A., M.B., Winchester House, Swansea.
1917. Langmead, L. B., Uplands, Honor Oak Road, Forest Hill, S.E. 23.
1894.*L* Lawson, Peter, Jesmond, 13, Nella Road, Fulham Palace Road, Hammersmith, W. 6.
1900. Lebour, Miss M. V., D.Sc., F.Z.S., Radcliffe House, Corbridge-on-Tyne, Northumberland.
1911. Leman, George C., Wynyard, 152, West Hill, Putney, S.W. 15.
1910. Levett, Rev. T. T., F.Z.S., Frenchgate, Richmond, Yorks.
1899. Lightfoot, Robert M., South African Museum, Cape Town.
1909. Linton, Mrs., Ye Olde Mill House, Castle Hill, Northallerton.
1908. Longstaff, Mrs. G. B., F.L.S., Highlands, Putney Heath, S.W. 15.

1912. Loyd, L. R. W., 17, Sandringham Court, Maida Vale, W. 9.
1898. Lucas, B. R., F.G.S., Winnington Park, Northwich, Cheshire.
1910. * Lucas, F. R. Tindall, Tewin Vale, Welwyn.
1891. Lyons, Lady, Venaway, Parkmill, R.S.O., Glamorganshire.

1906. Macindoe, Dr. A., D.P.H., Sidmouth, Devon.
1911. MacLeod, D. J., Hof Ter Meere, 13, Reigerstraat, Ghent, Belgium.
1917. *L* Marle, Rev. Robert, M.A., Cross Stone Vicarage, Todmorden, Yor
1885. Marquand, Ernest D., A.L.S., The Willows, Totnes, Devon.
1887. Marshall, J. T., c/o Editor of *Journal of Conchology.*
1915. Martin, George A., Highdene, St. Nicholas, near Cardiff.
1887. *P* Masefield, John R. B., M.A., Rosehill, Cheadle, Staffordshire.
1904. Massy, Miss A. L., Tredagh, Malahide, co. Dublin.
1889. Mayfield, Arthur, Mendlesham, Stowmarket, Suffolk.
1914. Mazyck, W. G., Hon. Curator, Charleston Museum, S. Carolina, U
1903. McClelland, Hugh, The Manor House, Berkswell, near Coventry.
1914. McMurtrie, Rev. John, M.A., The Manse, Skene, Aberdeenshire.
1880. *P* Melvill, James Cosmo, M.A., D.Sc., F.L.S., Meole Brace Hall, Shre
1904. Milne, James N., Westbank, Partickhill, Glasgow.
1906. Monterosato, Il Marchese di, 2, Via Gregorio Ugdalena, Palermo,
1910. Moorcock, J., 91, Broadfield Road, Catford, S.E. 6.
1902. *L* Moore, Chas. H., 103, Mottram Road, Stalybridge.
1907. Morey, Frank, F.L.S., Wolverton, Carisbrooke Rd., Newport, Isle of
1917. Morley, John, A.M.I.Inst.E., Clarence Lodge, Ashburton Road,
Park, Manchester.
1912. Murdoch, G. H., 49, Parliament Hill, Hampstead, N.W. 3.
1907. Musham, J. F., F.E.S., Haylands, Brook Street, Selby, Yorks.

1905. Napier, H. C., Elms Lodge, 39, Kingston Lane, Teddington.
1911. Nash, Rev. E. H., M.A., Wetley Rocks Vicarage, Stoke-on-Trent.
1891. *P* Newton, Richard Bullen, F.G.S., 11, Twyford Crescent, Acton Hill
1891. *P* Norman, Rev. Canon Alfred Merle, D.C.L., F.R.S., etc., T
House, Berkhamsted.
1915. Norwood, Mrs. Gilbert, 4, The Glen, Saundersfoot, Pembrokeshire.

1887. *L* Oldham, Chas., F.L.S., F.Z.S., The Bollin, Shrublands Rd., Berk
1910. Oliver, A. M., West Jesmond Villa, Newcastle-on-Tyne.
1896. *L* Overton, Harry, The Newlands, Boswell Road, Sutton Coldfield.
1905. *L* Owston, Alan, Yokohama, Japan.

1904. Parritt, H. W., 14, Stanhope Gardens, Highgate, N.
1886. Pearce, Rev. S. Spencer, M.A., Long Combe Vicarage, near Wo
Oxfordshire.
1913. Pellow, N. E., 319, Stratford Road, Sparkbrook, Birmingham.
1901. Penrose, G., Royal Institution of Cornwall, Truro.
1907. Petty, S. L., Dykelands, Ulverston, Lancs.
1908. Phillips, R. A., Ashburton, Cork.
1913. Presbrey, E. W., 17, Trinity Place, New Rochelle, N.Y., U.S.A.
1897. Preston, Hugh B., F.Z.S., Hôtel de France, Huelgoat, Finisterre,
1907. Priske, R. A. R., 9, Melbourne Avenue, West Ealing, Middlesex.
1906. *L* Pritchard, G. B., F.G.S., 38, Mantell Street, Moonee Ponds, Victo
1916. Pye, Alfred W., Mortagne, Dudley Street, Grimsby.

1916. Quick, Capt. Hamilton E., M.B., F.R.C.S., 51, Bryn Road, Swansea.

1906. L Radley, Percy E., F.R.M.S., 30, Foxgrove Road, Beckenham, Kent.
1906. Reynell, Alexander, Brackley, Crofton Lane, Orpington, Kent.
1905. * Reynolds, Laurence R., 233, Aspinwall Avenue, Brookline, Mass., U.S.A.
1913. Rhodes, F., 113, Heaton Road, Manningham, Bradford, Yorks.
1900. Richards, C. P., Mission House, Stenalees, St. Austell, Cornwall.
1906. Ritchie, John, jr., 581, Warren Street, Boston, Mass., U.S.A.
1898. Roberts, A. William Rymer, Rothamsted Experimental Station, Harpenden, Herts.
1913. Roberts, J. W., 145, Withington Road, Whalley Range, Manchester.
0 P Roebuck, W. Denison, M.Sc., F.L.S., 259, Hyde Park Road, Leeds.
1901. * Rooth, J. A., M.R.C.S., 6, Richmond Terrace, Brighton.
1893. Roseburgh, John, Market Square, Galashiels, Roxburgh.
1910. L Rowe, A. W., M.S., M.B., M.A.C.S., F.G.S., Shottendane, Margate.

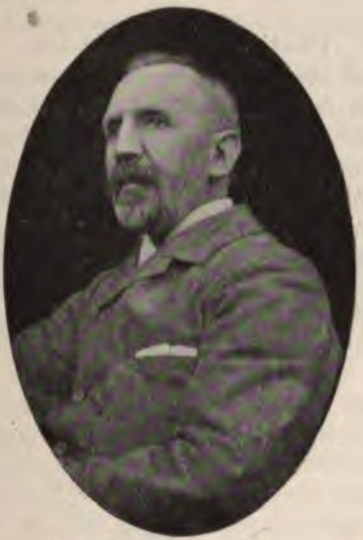
1914. Saban, Alfred J., 71, Surrey Road, Peckham Rye, S.E. 15.
1906. Salisbury, Albert E., 12a, The Park, Ealing, W. 5.
1877. P Scharff, Robert F., Ph.D., M.R.I.A., Knockranny, Bray, co. Wicklow.
1906. Schepman, M. M., Bosch en Duin, Huister Heide, Utrecht, Holland.
1895. L Schill, C. H., Crosten Towers, Alderley Edge. .
1910. L Shaw, H. O. N., B.Sc., F.Z.S., Wissett Hall, Halesworth, Suffolk.
1904. Shaw, Rev. W. A., Peper Harow Rectory, Godalming.
1906. Shopland, Commander E. R., Cecilia House, The Avenue, Lowestoft.
1910. Shrubsole, George, Elm Bank, Workington, Cumberland.
1895. Sich, Alfred, F.E.S., Corney House, Chiswick, W. 4.
1905. Simpson, James, c/o G. Sim, Esq., A.L.S., 52, Castle Street, Aberdeen.
1902. Smallman, Raleigh S., Eliot Lodge, Albemarle Road, Beckenham.
1892. Smith, Mrs. Louisa J., Monmouth House, Monmouth St., Topsham, Exeter.
1899. L Smith, Mrs. Lucy A., Cricklade Street, Cirencester.
1907. Smith, Maxwell, Hartsdale, Westchester Co., New York, U.S.A.
1894. Smith, Wm. Chas., 92, Dawes Road, Fulham, S.W. 6.
1900. Solly, E. H., Lea Orchard, Ottinge, Elham, near Canterbury.
1917. Sowden Harry, Hon. Recorder, York and District Field Naturalists, Micklegate Bar, York.
1886. Sowerby, Geo. Brettingham, F.L.S., 26, Ennerdale Rd., Richmond, Surrey.
1907. Spence, G. C., 10, Pine Grove, Monton, Eccles, Lancs.
1914. Stainton, Ernest, 70, Jubilee Road, Doncaster.
1906. Stalley, Henry J., Thorntona, Oxted, Surrey.
1886. P Standen, Robert, The Museum, The University, Manchester.
1911. * Standish, C. M., Prospect House, Weldbank, Chorley.
1915. Steenberg, C. M., Mag. Sc., Royal Observatory, Ostervoldgade, 3, Copenhagen.
1903. L Stelfox, A. W., M.R.I.A., Ballymagee, Bangor, co. Down.
1910. Stephenson, H. L., 90, Tempest Road, Beeston Hill, Leeds.
1908. L Stobart, H. J. S., Belbroughton, Stourbridge.
1896. Stonestreet, Rev. W. T., B.D., F.R.S.L., Arnholm, 268, Hornby Road, Blackpool.
1897. Stracey, Bernard, M.B., 26, De Montfort Street, Leicester.
1890. Stubbs, Arthur Goodwin, The Meads Cottage, Hailey Lane, Hertford.
1893. Stump, Edward C., Balgownie, Rochdale Road, Blackley, Manchester.
1895. Swanton, E. W., The Educational Museum, Haslemere, Surrey.
1888. P Sykes, Ernest Ruthven, B.A., F.L.S., Longthorns, Blandford.

1910. Tattersall, W. M., D.Sc., The Museum, The University, Manchester
1895. Taylor, Frederick, 32, Landseer Street, Park Road, Oldham, Lancs.
1907. Taylor, G. H., School House, Higher Blackley, Manchester.
1904. L* Taylor, Gerald Medland, Rossall School, Fleetwood.
1907. Taylor, J. Kidson, 45, South Avenue, Buxton.
1903. Thaanum, D., 5, Church Street, Hilo, Hawaiian Islands.
1907. L Thornton, H. G., Kingsthorpe Hall, Northampton.
1886. L Tomlin, J. R. le B., M.A., F.E.S., 120, Hamilton Road, Reading.
1906. Turton, Lt.-Col. W. H., D.S.O., R.E., 30, Caledonia Place, Clifton, Bri
1907. Upton, Charles, Rooksmoor, Tuffley Avenue, Gloucester.
1914. Van der Sleen, Dr. W. G. N., Eidenoutstraat, 63, Haarlem, Holland.
1915. Van Hyning, T., Curator, Florida State Museum, Gainesville, Fla., U.S
1899. Vaughan, J. Williams, J.P., Pen-y-maes, Hay, *via* Hereford.
1897. Vignal, Louis, 28, Avenue Duquesne, Paris.
1902. Vincent, W. C. W., 39, West Bank, Stamford Hill, N. 16.
1898. Wakefield, H. Rowland, 7, Montpelier Terrace, Swansea.
1891. Walker, Bryant, 1306, Dime Bank Building, Detroit. Michigan, U.S.A.
1917. Wallace, Henry Simpson, F.E.S., 6, Kayll Villas, Sunderland.
1907. Wallis, E. A., Springfield, West Parade, Scarborough.
1900. L Watson, Hugh, Bracondale, The Avenue, Cambridge.
1908. Weaver, G. H., 31, Devonshire Road, Palmer's Green, N.
1900. Webb, Walter F , 202, Westminster Road, Rochester, N.Y., U.S.A.
1902. Weeks, Wm. H., 508, Willoughby Avenue, Brooklyn, N.Y., U.S.A.
1895. Welch, Robert John, M.R.I.A., 49, Lonsdale Street, Belfast.
1913. Western, W. H., 9, Redearth Road, Darwen.
1907. Wheat, Silas C., 987, Sterling Place, Brooklyn, N.Y., U.S.A.
1917. Whitelock, Wm. H., Rosedale, Westbourne Rd., Edgbaston, Birmingham
1916. Whitwell, John W., 39, Queen's Way, Wallasey.
1886. Whitwell, Wm., Brookside, Darley Green, Knowle, Warwickshire.
1911. * Williams, James M. M., Imperial House, Pontlottyn, Cardiff.
1889. Williams, John M., 31, Grove Park, Liverpool.
1915. Wilman, Miss M., The McGregor Museum, Kimberley, South Africa.
1913. Winckworth, Ronald, 37, Upper Rock Gardens, Brighton.
1917. L Wintle, Wm. James, F.Z.S., 47, Vincent Square, Westminster, S.W. 1.
1901. L Woodruffe-Peacock, Rev. E. A., F.L.S., etc., Cadney, Brigg, Lincs.
1898. Woods, Henry, M.A., F.G.S., Sedgwick Museum, Cambridge.
1886. L Woodward, Bernard B., F.L.S., etc., 4, Longfield Rd., W. 5.
1914. Worsfold, Herbert W., 28, Melody Road, Wandsworth, S.W. 18.
1895. Wright, Charles East, Neale Avenue, Kettering.

◆

Pisidium hibernicum in Carnarvonshire.—Among some Pisidia from Welsh mountain tarns that I sent to Mr. A. W. Stelfox recently, he recognised specimens of *Pisidium hibernicum*, and his determination was confirmed subsequently by Mr. B. B. Woodward. The shells in question were obtained in July, 1916, in Llyn Dwythwch, the lake which lies at an altitude of 920 feet in Cwm Dwythwch, beneath the eastern slope of Moel Eilio, a mile and a half south of Llanberis. They are much less swollen and more strongly striated than specimens from the type locality, Lough Nagarriva in South Kerry, but the peculiar twist in the principal anterior lateral teeth, the deep fossæ behind them, and the symmetrically arched hinge-line are characteristic. The only other species I could find in the llyn was *Limnæa pereger*, and that but sparingly.—C. OLDHAM (*Read before the Society, February 14th, 1917*).

PORTRAIT OF THE LATE REV. L. J. SHACKLEFORD.



Yours very sincerely,
Lewis J. Shackleford

[see p. 193.

◆

Physa acuta Drap. **in Middlesex.**—*Physa acuta* Drap. was noticed more than fifty years ago in one of the lily tanks in Kew Gardens, where it has always lived under tropical conditions. There does not appear to be any record of its occurrence in our southern counties in a "natural" habitat except at Aylesbury (as *P. heterostropha* in 1916. *Journ. of Conch.*, xv., p. 96). This summer it has occurred in great abundance in part of the Welsh Harp reservoir at Hendon, and also in one stretch of the river Brent, about a mile further upstream. It must have lived in both places for some years, as the shells may be collected in all stages of growth.—J. E. COOPER (*Read before the Society*, Sept. 12th, 1917).

◆

PHOTINULA WACEI sp.n. FROM THE FALKLAND ISLANDS.

By JAS. COSMO MELVILL, M.A., D.Sc., and ROBERT STANDEN.

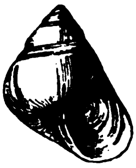
(Read before the Society, March 14th, 1917).

Photinula wacei sp. nov.

Ph. testa mediocri, tenui, lævi, conoidea, margaritacea, epidermide omnino olivacea tenuissime contecta, imperforata, anfractibus 5–6, quorum apicales 2–3 parvi, cornei, subhyalini, apice ipso deplanato, cæteris lævibus, apud suturas vix impressis, ultimo anfractu infra suturam indistincte spiraliter bitæniato, labro paullum effuso, tenui, versus basim leniter producto, columella obliqua, simplice, apertura læté intus margaritacea, operculo corneo, multispirali.

Alt., 8; diam., 7 mm.

Hab., Falkland Isles. Coll. Dr. Richard Wace, of Darwin, East Island.



Photinula wacei sp. nov.

We have quite lately received, in company with a very fine example of *Cerithium pullum* Phil. (= *cælatum* Couth.) this distinct little *Photinula*, which appears to differ from any of the varieties of its congeners, *Ph. expansa* and *Ph violacea* King, as figured[1] by the late Dr. Hermann Strebel in his exhaustive work on the molluscan fauna of the Province of Magellan, including the Falklands.

Our proposed species differs from *Ph. violacea* King in its narrower and more conoid form, entirely also in coloration, also in the slighter sutural impression, and absence of ventricosity in the whorls. The double spiral tæniæ or bands on the body whorl, just below the sutures, though indistinct, are characteristic, and, finally, the texture and substance of the shell shew much greater tenuity. In general aspect *Ph. wacei* possesses considerable superficial likeness to one of the smaller *Elenchi*.

Mr. Rupert Vallentin kindly forwarded us these specimens, and to him and Dr. R. Wace our thanks are due for the permission to describe it.

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[1] Beiträge zur Kenntn. der Mollusken-Fauna der Magalhaen Provinz. Zool. Jahrb. Suppl. vii., 1905, p. 145, Taf. v., figs. 1—8, 11b, 12—13.

ON THE RECENT MISAPPLICATION OF THE NAMES PISIDIUM NITIDUM AND PISIDIUM PUSILLUM OF JENYNS.

BY A. W. STELFOX, M.R.I.A.

(Read before the Society, October 13th, 1917).

THE number of species of *Pisidium* recognised by Gwyn Jeffreys in his "British Conchology" was only five, and at the time I received my first lessons in malacology Jeffreys's views were accepted generally, but in the light of our present-day knowledge of the genus it is not surprising that uncertainty was often felt in referring specimens definitely to one or other of the four smaller species. No difficulty, it is true, arose with typical examples of such characteristic species as *P. henslowanum*, *P. pulchellum* (regarded by Jeffreys as varieties of his *P. fontinale*) or *P. milium*, and it seemed to me that *P. nitidum* was equally unmistakable, for its clean and shining appearance, and to quote Jenyns's own words "the peculiar striæ drawn with great regularity across the umbones near the apex of each valve, and cut rather more deeply than the rest" distinguished it at once from the shells with dull epidermis, usually encrusted with extraneous matter, that one regarded as *P. pusillum*. Indeed, the common practice was to refer any small *Pisidium* in which the umbones were more or less central tŏ *P. nitidum* if the shell were clean, and to *P. pusillum* if it were encrusted, whilst if the umbones were nearer to the posterior end *P. fontinale* was available as a dumping-ground for it.

When, after years of comfortable acquiescence in this method of determining the species, I came to regard the subject from the ecological standpoint, doubt as to its efficacy soon arose. I found that the two forms commonly regarded as *P. pusillum*, type, and *P. pusillum* var. *grandis*, nearly always occurred in association, but showed marked differences at all stages of growth, and the possibility of their being distinct and not merely varieties of a single species was forced upon me. Shells of these associated forms which I sent some time afterwards to Mr. B. B. Woodward were referred by him to *P. personatum* Malm and *P. casertanum* Poli, and my preconceived idea of their distinctness was confirmed; but it did not then occur to me to ask, if *P. pusillum* be *P. personatum*, and *P. pusillum* var. *grandis* be *P. casertanum*, what then can be the shell that Mr. Woodward regards as *P. pusillum*. It certainly did not occur to me that it was the shell I had always looked upon as Jenyns's *P. nitidum*.

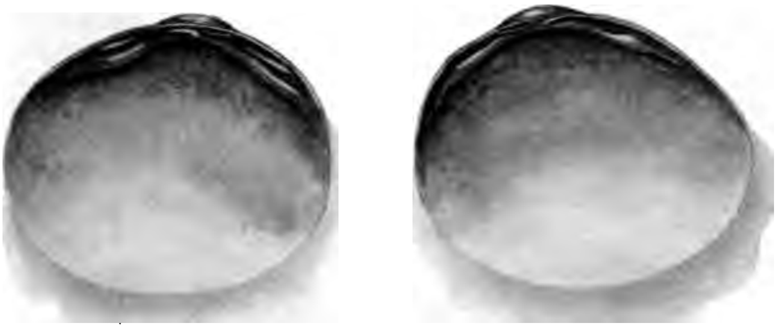
I have said already that the identification of *P. nitidum* in the old days did not seem difficult, and this may have been because my idea of the species was based upon shells with a shining epidermis and well-marked umbonal striæ that occurred in the Wolfhill mill-dam near Belfast, and the knowledge that *P. nitidum* had been discovered in this mill-dam by William Thompson soon after Jenyns's description of the species was published, coupled with the fact that Thompson's specimens had been referred by Jenyns himself to *P. nitidum*. Indeed I looked upon the Wolfhill shells as practically co-types of Jenyns's species, and was surprised when similar specimens from other localities which I sent to Mr. Woodward were pronounced by him to be *P. pusillum*, especially as shells which Mr. Woodward referred to *P. nitidum* did not accord to my mind with Jenyns's description o that species. I knew that Mr. Woodward had examined Jenyns's type specimens, and my surprise and perplexity grew when I found that the species I always looked upon as *P. nitidum*, but which Mr Woodward referred to *P. pusillum*, possessed a funnel-shaped siphona tube with "the aperture very patulous, sometimes plaited at the margin, and more or less crenate," a character upon which Jenyns laid great stress in the diagnosis of his *P. nitidum*. Mr. Woodward in his "Catalogue" attaches great importance to the character of the hinge and it is noteworthy that the hinge of the clean shining shells that I had always associated with *P. nitidum* agree with Mr. Woodward's description of the hinge of *P. pusillum* as understood by him. My doubt as to Mr. Woodward's identification of Jenyns's species grew when I turned to Jenyns's account of their respective habitats, for he states that *P. nitidum* inhabits "various situations, though seemingly partial to clear water," whilst *P. pusillum* resides "chiefly at the bottoms of drains and ditches, where I have often found it living at a considerable depth in the mud," an apt description of the conditions under which live (*a*), the clean shining shell that Mr. Woodward refers to *P. pusillum*, but which I had been brought to regard as *P. nitidum*, and (*b*), *P. personatum*. Taking everything into consideration I could not escape the conclusion that the *P. pusillum* o Mr. Woodward was Jenyns's *P. nitidum*.

Mr. C. Oldham, with whom I had discussed the subject, was in Bath recently, and took advantage of the opportunity to examine Jenyns's shells in the Museum of the Bath Royal Literary and Scientific Institution. The collection includes a drawer of specimens o *Sphærium* and *Pisidium*. The shells are mounted on tablets; no localities are given, but the names are written on the tablets in Jenyns's hand.

One tablet bears the inscription :—

> "The above are the identical specimens figured in my 'Monograph of the British species of *Cyclas* and *Pisidium*,' in the fourth volume of the *Transactions of the Cambridge Philosophical Society*, pll. 19–21."

Mr. Oldham writes of the specimen of *P. nitidum* which was figured by Jenyns and is indicated on this tablet by the words "Pl. 20, fig. 7:"


Right valve. Left valve.

Pisidium nitidum Jenyns (= *P. pusillum* (Jenyns) B. B. Woodward).
Magnified about 21 diameters.
From specimen in "Hyndman Collection," Belfast Municipal Museum, labelled "*P. nitidum*. English. Mr. Jenyns to W.T."
A.W.S. del. Oct., 1917.

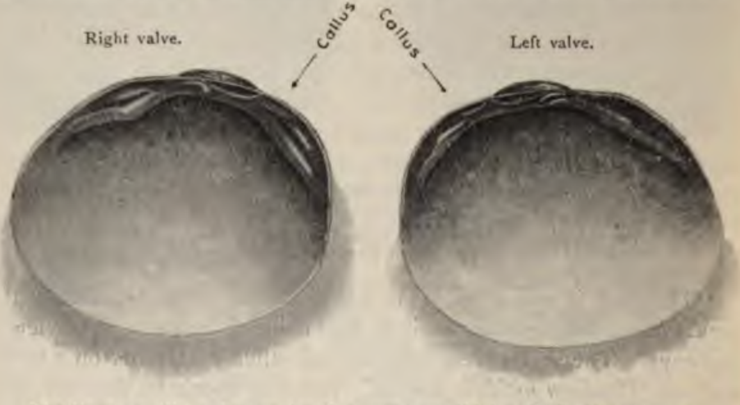
"The shell is unopened. The figure is a bad representation of the actual shell, and fig. 8 shows it as flatter than it really is when viewed endways. The shell agrees with several other specimens on a tablet marked '*Pisidium nitidum* Jenyns.' The only specimen that has been opened has the entire hinge obscured by the dried-up animal, so that nothing can be deduced from the teeth. The striæ are strongest at the place of demarcation between the nepionic and adult shell, and the outline suggests the species that Mr. Woodward refers to *P. pusillum*, but the nitid character so noticeable in most of the shells so named by him is absent.

This absence is due perhaps to age and decay. Many of the shells are more or less encrusted with the white salt that is often so troublesome in shell collections, and it is evident that at some time or another all the shells on this tablet, as well as the type specimen, have been varnished, for older deposits of the salt are discernible under a film of gum-like stuff.

The umbones are not prominent, are blunt, and not central, the anterior of the shell being somewhat produced. The shells on four other tablets, marked *nitidum*, are in an equally unsatisfactory condition. In spite of my inability to see the hinge characters, I have little doubt in referring the shell that Mr. Woodward calls *P. pusillum* to the *nitidum* of Jenyns."

Of the type specimen of Jenyns's *Pisidium pusillum* Mr. Oldham writes:—"Shell unopened. The rounded outline and silky texture due to very fine striation indicate *P. personatum*. The specimen matches exactly a long series on a tablet marked '*Pisidium pusillum*

Jenyns.' One of these is open and is beyond doubt *P. personatum*. The callus is well marked in both valves. Seven unopened shells on another tablet marked '*Pisidium pusillum* Jenyns' comprise, I think, *P. personatum* and *P. hibernicum*. A tablet marked '*Pisidium pusillum* var.' has had all the shells removed. Specimens on a further tablet marked '*Pisidium pusillum*' (with a ? in pencil) are *P. casertanum*. Shells on four tablets marked '*Pisidium cinereum* Alder' are all *P. casertanum*. Open valves in each series show the hinge characters well."



Pisidium pusillum Jenyns (= *P. personatum* (Malm) B. B. Woodward).
Magnified about 21 diameters.
From specimen in "Hyndman Collection," Belfast Municipal Museum, labelled "*P. pusillum*. English. Mr. Jenyns to W.T."
A.W.S., del. Oct. 1917.

It will be seen that Mr. Oldham's notes fully bear out my own conclusions that Mr. Woodward's *P. pusillum* is that described by Jenyns as *P. nitidum*; and that the *P. pusillum* of Jenyns is the *P. personatum* of Mr. Woodward, and also includes forms of the latter's *P. casertanum*. I have obtained still further and quite independent evidence which points to the same conclusion. In the collection in the Belfast Municipal Museum are five specimens sent by Jenyns to William Thompson, labelled "*Pisidium pusillum*. English. Mr. Jenyns to W.T." These were completely encrusted with a blackish coating, but upon being opened proved to be typical *P. personatum*. In the same collection there exist two shells labelled "*P. nitidum*. English. Mr. Jenyns to W.T.," and these are typical examples of the shell regarded by Mr. Woodward as *P. pusillum*. By the kindness of the Curator, Mr. Deane, I have been permitted to make drawings of one shell from each of these historic sets, and these are here reproduced.

It may be asked what, then, is Mr. Woodward's *P. nitidum*? But that is a question to which I can give no conclusive answer. The large diagrammatic figure of his *P. nitidum*, given by Mr. Woodward in his Catalogue, pl. 1, fig. 9, certainly resembles forms of *P. casertanum* as stated in the text, p. 46; but the majority of the shells named *P. nitidum* by Mr. Woodward which have passed through my hands—mainly from the collections of Messrs. J. E. Cooper and R. A. Phillips—do not bear any great resemblance to the above mentioned figure, and in my opinion are referable to normal forms of *P. obtusale*.

Whether, under the circumstances, Jenyns's name *P. pusillum* must replace that of *P. personatum* is more a matter for those who interest themselves in questions of nomenclature than for a field naturalist; but as the name *P. pusillum* of pre-Jenyns authors appears to have covered all the smaller species of the genus indiscriminately, and as it is admittedly impossible to say what the original *P. pusillum* of Gmelin really was, I would suggest that, to avoid future confusion, the name should be dropped.

The three species involved, therefore, would be named as follows :-

P. personatum Malm (fide B. B. Woodward)
= *P. pusillum* Jenyns.
P. casertanum (Poli) B. B. Woodward
= *P. pusillum* Jenyns, in part.
P. nitidum Jenyns
= *P. pusillum* B. B. Woodward.

The evidence adduced by Mr. Woodward in support of Poli's name *casertanum* is not very convincing, but as it tends to confirm the tradition held by many French authors, I think that it would be best to accept it rather than to turn to the *P. australe* of Philippii, which just antedates Alder's name *cinereum*.

The casual reference to *P. hibernicum* in Mr. Oldham's notes may come as a surprise to many, and it may be well to explain that we now know this species to be widely distributed in the British Islands, though hitherto confounded with *P. obtusale* and *P. nitidum* (*P. pusillum*, B. B. Woodward). It may be found in association with these species in many localities that we know of, and there is therefore no doubt that it is distinct from both. That it has so long escaped notice is no doubt due in part to the fact that since the time of Jeffreys no ecological work seems to have been attempted in this group. The unfortunate fact that Westerlund described the species from the very aberrant form that lives in the semi-alpine Lough Nagarriva, has perhaps caused conchologists to overlook it, though once known it is one of the easiest species to recognise, even in the field.

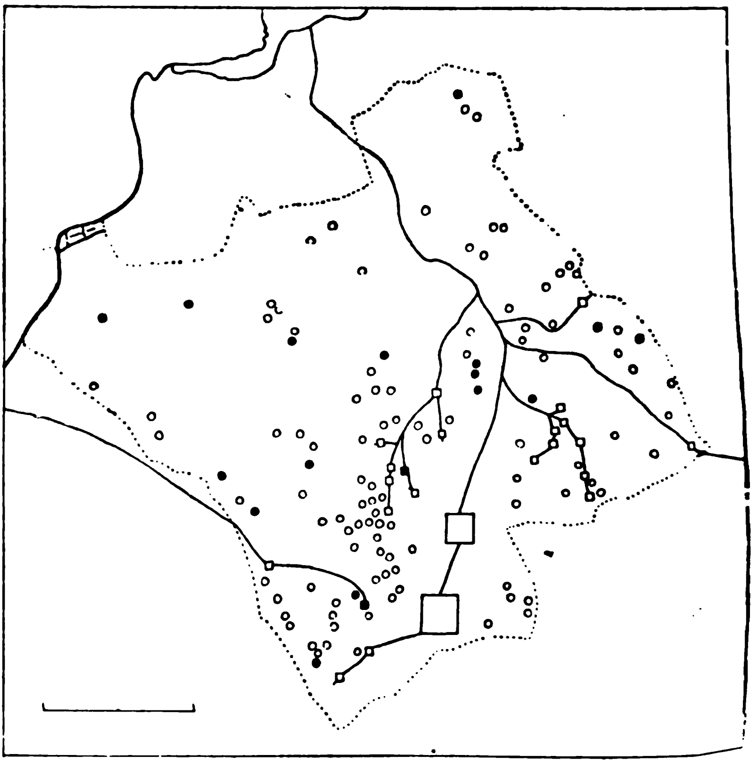
For their kind co-operation in the preparation of these notes, I wish to tender my thanks to Messrs. Charles Oldham and R. A. Phillips, and especially to the former for English and Welsh material and for his notes on the Jenyns types. My thanks are also due to Mr. J. E. Cooper for permitting Mr. Phillips and myself to examine a large series of shells named *P. nitidum* and *P. pusillum* by Mr. Woodward.

THE HABITATS OF FRESHWATER MOLLUSCA.

By A. E. BOYCOTT, M.A., D.M., F.R.S.

(Presidential Address delivered at the Annual Meeting, October 13th, 1917).

THOSE of us whose interests in conchology lie chiefly in the study of British land and freshwater mollusca are hardly in a position to make any substantial contribution to systematics, and our predatory passion to catch an unfamiliar sort finds infrequent gratification. But the paucity of species in our own fauna removes to a large extent the incubus of a collection, and incites us to try and achieve some new knowledge out of what material is at hand, rather than do once more what has been done often enough already. The intensive study of the three or four score species which most of us have in our neighbourhood opens up ample fields of enquiry—variation, habits, food, breeding, anatomy, distribution, and what not—which are of obvious biological importance, and which have not, I think, received all the attention they deserve.



Sketch map of watery habitats of Aldenham Parish. Squares indicate running, circles closed ponds. The distribution of *Sphærium lacustre* is also shown. Scale one mile.

The particular topic to which I should like at the moment to direct your attention is the œcology of freshwater mollusca. Every practical naturalist knows that different kinds of animals are apt to live in different kinds of places, but it is only in comparatively recent times that there has been any serious attempt to give precise answers to the questions—(1) what is the characteristic habitat of each species?, and (2) why is it characteristic? The answer to the first question should be comparatively easy; it is a matter of observation, though observation as always must be tinged with provisional explanatory speculation, which by trial and error, new observation and experiment may be expected to bring us ultimately to the generalisations which will constitute the second answer. Reference to our literature shows that both questions have hitherto been neglected.

The parish of Aldenham extends over some 6,000 acres in the south of Hertfordshire, and I purpose to give a short account of the occurrence of water snails in this area as nearly as pretty assiduous attention during 1915 and 1916 has informed me of the facts. The watery habitats presented by this district—and for its parochial limitation there is no particular excuse beyond the necessity of some sort of boundary—fall into four main groups:—

(*a*), the *river* Colne in the north-west, with its accessory ditches and backwaters:

(*b*), two *lakes* in the south, in intimate relation with one another, and ultimately with the river, through

(*c*), a *stream* with four subsidiary branches; a second small stream is on the western boundary:

(*d*), 163 *ponds*, mostly in the southern two-thirds of the parish on the grass land of the London clay; the north-western third lies on chalk overlaid with gravel and clay, and is mainly arable and pondless. Of these ponds we may provisionally distinguish two groups:—

(I.), *running ponds* through which there is always or at some time of the year an obvious flow of water; the former approximate to streams, the latter to the next group; of this sort we have 22;

(II.), *closed ponds* in which there is at no time any patent stream flowing in or out; of this sort we have 141, of which 17 are liable to be dry for a substantial part of an ordinary summer ("drying ponds"), and 11 are too much humanised by ducks to be usefully considered; there remain 113 for examination.

Since any final œcological classification of watery habitats will have to take into account the whole of their biological, chemical and physical characteristics, we need not as a preliminary spend much time in trying to define our terms. "Lake," "pond," "pool," "stream," "ditch," are at once elusive and precise; at any rate meticulous delimitation will demand a fresh terminology. "Lake" connotes a substantial size, a depth in parts beyond the limit of most water plants, the possibilities of wave action; "ponds" are smaller—the present series mostly about 400 square yards in area or less, shallower, more fluctuating in volume; "streams" are, in parts at any rate, dominated by a rapid current, but physically they are not homogeneous; "ditches" by their existence postulate a flow of water at some time or other; of "tarns," "meres," "loughs" there are no local representatives.

It may be objected to the whole enquiry that it is not possible to find out accurately what is the molluscan content of any body o water, however small. The Aldenham ponds have each been examined at least twice and the variations in the results have been relatively trivial. There is no doubt that the snail population o ponds varies both by accretion and by loss, and any investigation fo the present purpose must therefore have a time limit, so that it i hardly possible to make the infinitely frequent examinations which might solve the question as to whether "the snail is not there" and "I cannot find the snail there" are as nearly synonymous as w flatter ourselves. On the whole I imagine that the two expression are not very far from being equivalent, with the proviso that searc has been made at suitable seasons and in a proper temper of bod and mind. At the worst, the present facts may be taken as compa able among themselves; with the same worker a negative result i one pond cannot be worth very much more or less than a negativ result in another. But from these optimistic conclusions I should b inclined to exclude the smaller species of *Pisidium*, which are apt t live in very localised areas in relation to the absence on the bottom of the homogeneity which characterises the main bulk of any bod of water.

The results obtained in this way are briefly summarised in the fo lowing table. The river, the lakes, the streams and all the runnin ponds contain snails of one kind or another; of the 113 closed pond 27 have yielded none, and for purposes of comparison it is probabl best to consider only the remaining 86 which are demonstrably a well as presumptively compatible with molluscan life.

The different localities evidently differ a good deal both in thei richness in molluscan life and in the kinds which are prevalent. Th river with its annexes yields as many as 26 different species, of whic six are small *Pisidia*; this is not due to a summation of habitats c obviously varying qualities ranging from the rapids of the river on th

	River	Streams	Lakes	Running ponds	Closed ponds
Number of habitats in each group	1	6	2	22	86 (113)
Limnæa peregra	x	6	x	20	31
L. auricularia	x	—	x	—	—
L. palustris	x	1	—	3	2
L. stagnalis	x	1	x	7	8
Planorbis corneus	x	—	—	—	—
P. albus	x	3	x	7	13
P. nautileus	—	—	—	7	40
P. complanatus	x	1	—	5	5
P. vortex	x	2	—	5	3
P. leucostoma	—	—	x	1	4
P. contortus	x	1	—	2	—
P. fontanus	x	—	—	6	13
Ancylus fluviatilis	x	1	—	—	—
A. lacustris	x	—	—	3	20
Physa fontinalis	x	1	—	—	—
Bith. tentaculata	x	—	—	—	—
B. leachii	x	—	—	—	—
Valvata piscinalis	x	—	—	—	—
V. cristata	x	—	—	—	—
Paludestrina jenkinsi	—	—	—	1	—
Unio pictorum	—	—	x	—	—
Anodonta cygnea	x	—	x	—	—
Sphærium corneum	x	1	—	6	17
S. lacustre	—	—	—	2	16
Pisidium amnicum	x	—	—	—	—
P. casertanum	—	2	x	—	3
P. nitidum	x	2	—	1	4
P. personatum	—	—	—	2	4
P. pusillum	x	1	x	—	1
P. milium	x	—	—	3	10
P. pulchellum	x	—	—	—	—
P. subtruncatum	x	4	—	4	4
P. henslowanum	x	—	—	—	—
P. obtusale	—	1	—	1	4

one hand to the almost still backwaters on the other, since all the species enumerated occur in one large gently flowing artificial fish-pond. The streams are on the other hand clearly not homogeneous, and their connection with various ponds, the lakes and one another makes their total of species less significant. The lakes have yielded but seven larger sorts and two *Pisidia* ; they are the least easy of loci to examine, though in the present case search among the débris after storms has confirmed the exiguous results of fishing. Closed an running ponds yield about the same total of species, though a mor detailed analysis shows that running ponds contain on the averag 3·7 species, closed ponds 2·3 sorts, or including the snailles ponds only 1·7; the four running ponds in which the flow i perennial average as many as 7·5. The largest number of species i any running pond is eleven (*peregra, palustris, stagnalis, albus, vorte contortus, fontanus, jenkinsi, corneum, subtruncatum, milium*); th most prolific closed ponds yield eight and nine sorts respectivel (*peregra, fontanus, nautileus, lacustris, corneum, lacustre* and *miliu* in both, with *palustris* in one and *casertanum* and *subtruncatum* i the other).

It appears, therefore, as if one could arrange the habitats in a ascending order of general suitability—closed ponds, running pond river. And the question immediately arises, whether this may n be just the order in which these different places are the more likel to receive additions to their fauna. If one assumes that the distr buting agents of freshwater mollusca act in such a way that the di persal they effect is equivalent to promiscuous projection from th sky, it is evident that a river valley with secondary flood dispers offers a larger collecting ground than the basin of a pond, and th a running pond is in the same way more apt to accumulate specie than a closed pond. But it is more reasonable to assume that di persal by birds, beetles, frogs and what not is not at random, but i definite relation to units of water, and not directly proportional t their size. In any case the present comparison is not between on river and one pond, but between a river and more than a hundre ponds, which as recipients of indiscriminate dispersions are probabl collectively of the same order of magnitude as the Colne. Provisio ally, therefore, I would reject the possibilities of dispersion as bein the complete or even the main explanation of the phenomena und discussion, a conclusion which receives I think substantial suppo from a consideration of the facts relating to individual species.

L. auricularia, for example, is restricted to the river in the nort and the lakes in the south; *L. peregra* occurs in both places and i 51 of the 108 ponds which contain any snails. The eggs, youn adults and habits of the two species are so similar that it is hardl possible to believe that suitability for dispersion is the explanation the difference in their distribution rather than suitability of the loc into which they happen to be dispersed. *P. contortus* similarly found in the river, in two permanently running ponds (in connectio with one another) and in one stream, but in no closed ponds; b contrast *nautileus* is the most frequent species in closed ponds, occu ring in no less than 40 of the 86; and *albus* lives in 20 ponds as well as in the lakes, streams and the river. As a parallel among plants we may note that *Potamogeton lucens* has the same distribution as *auricularia*, while *P. natans* is like *peregra* and has been seen in 42 ponds. Maps of the distribution of each species indicate, with the exception of *P. complanatus*, a random topographical occurrence which further diminishes the apparent importance of dispersion as contrasted with habitat.

As is evident from the table the different species[1] fall into more or less definite habitat groups.

(*a*). We have in the first place a series of nine species which are common to all groups of habitats:—

Limnæa peregra,
L. palustris,
L. stagnalis,
Ancylus lacustris,
Sphærium corneum,
Planorbis albus,
P. complanatus,
P. fontanus,
P. vortex.

Of these, *peregra, palustris, stagnalis, complanatus* and *vortex* appear to prefer habitats other than closed ponds. *Palustris* occurs in very good habitats (river) or in very bad ones (drying roadside puddles) and considering this flexibility it is wonderfully uncommon.

(*b*). The second obvious series is the list of twelve species which are absent from closed ponds and, with the exception of *P. contortus*, from running ponds also:—

Limnæa auricularia,
Planorbis corneus,
P. contortus,
Ancylus fluviatilis,
Physa fontinalis,
Anodonta cygnea,
Bithinia tentaculata,
B. leachii,
Valvata piscinalis,
V. cristata,
Pisidium amnicum,
Unio pictorum.

Among these we may distinguish several subsidiary groups.

(α). *Anodonta*, *Unio* and *auricularia* are confined to the river and lakes. The occurrence of the larger bivalves is a special case, since it is conditioned by the occurrence of fish on which they may achieve the parasitic phase of their development. Whether any particular kinds of fish are necessary for the naiads with which we are concerned I do not know. But what is immediately germane, Mr. Latter, as he has been good enough to tell me, has succeeded in the difficult experiment of breeding *A. cygnea* through its metamorphosis on the stickleback. We have, therefore, definite evidence that that fish will suffice. Our ponds are not altogether without fish; carp occur in three closed ponds, sticklebacks (*G. aculeatus* and *pungitius*) in seven closed and nine running ponds and likely enough in others that I have missed. Twenty fishy ponds out of 135 is rather a thin distribution of an essential factor, and the absence of ***Anodonta*** in the ponds may be due to the failure of the necessary concurrence of chances. I suspect, however, that these large animals prefer the larger bodies of water on other grounds than homœopathic magic.

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[1] I here omit the smaller *Pisidia* for reasons I have already indicated; it may be significant that *pulchellum* and *henslowanum* have been found only in the river area, and that this has not produced *personatum* and *obtusale*. There is evidently a fine field for enquiry here.

(*β*). *Bithinia* and *Valvata* with *Planorbis corneus* and *P. amnicum* are restricted to the river area. As regards the operculate species, it is possible that their capacity for clinging to translated objects diminishes their chances of free dispersion; it may well be imagined that a young *Bithinia*, finding itself on the historical duck's foot, would be frightened enough to close its operculum without waiting for the new pond of which unconscious memory might warn it. It is on the other hand easy to exaggerate—or minimise—the difficulties of trave when we have no real knowledge of how it is in fact accomplished and it must not be forgotten that with the operculum is correlated a branchial rather than a pulmonary respiration.[1]

(γ). The remaining three sorts occur in the river and in othe running water: *Ancylus* in the brook, *P. fontinalis* in a branc stream, *Pl. contortus* in another branch stream and in two communicating permanently running ponds. There is no obvious explanatio of this distribution; and why these species, together with *L. auricularia*, *Pl. corneus*, and *P. amnicum*, find in ponds an uncongenial se of circumstances is apparently the same problem as why *Pl. complanatus* and especially perhaps *Pl. vortex* prefer running ponds to close ponds, and why in general running water provides more prolific loc than closed ponds. So also as there is a continuous gradation fron quick streams to still water, which for convenience we have to divid into arbitrary groups, there seems to be a series of snails varying fron *Ancylus fluviatilis* which will only live in definitely running water through *e.g.*, *Planorbis corneus*, which at any rate very much prefer moving water, to sorts like *Pl. albus* or *L. peregra* or *A. lacustris* which seem more or less indifferent. Whether any species actuall prefer stagnant water in the ordinary sense is discussed below.

The question is perhaps best approached in the form of an enquir why small closed ponds afford an indifferently good habitat. It i not possible here to discuss fully the many considerations which ma be germane; a brief outline of the more obvious factors is all I ca attempt.

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[1] Our district does not supply the evidence that these species are not excluded from th ponds and lakes simply because the water is soft and the river water hard; *B. tentaculata* and *P. amnicum* live in the very soft water of the Herefordshire Wye; *P. amnicum*, *B. tentaculata* and *V. piscinalis* in the Manchester city supply.

(1). Physically our closed ponds have more considerable and sudden oscillations of *temperature* than larger and especially deeper bodies of water. The temperature of a pond two or three feet deep follows the air temperature pretty closely, even with a rising temperature, especially if the surface is stirred with a wind. There is no stationary layer of cold water on the bottom as in deep lakes. In the result such ponds are hit rather hard in short cold spells, and with free exposure to the sun the temperature may rise to the neighbourhood of 30°C on a hot summer afternoon. But in making similar observations on the waters of our river area I have been surprised to find that the conditions are not as widely different as I had anticipated. The river Colne itself rises and falls in temperature rather less than our ponds, but it is not far behind, and the specially prolific backwaters, at any rate about the edges where the characteristic operculates and *P. amnicum* chiefly abound, behave practically as does a small pond. I am inclined, therefore, to attach relatively little importance to the temperature question in respect of the local problem; with deep lakes the state of affairs is, of course, quite different.

(2). A second physical, or rather physico-chemical consideration, arises in *muddiness*. The factors which appear to be concerned in this case are—(*a*), the presence of clay; (*b*), mechanical disturbance to suspend the clay in the water; (*c*), the presence or absence of sufficient salts in solution which will determine the agglutination and precipitation of the suspended clay particles. Clay is practically always present on the floor and sides of ponds; the influence of cattle or ducks illustrates well the results of mechanical disturbance; of the possible salts, those of calcium alone are present in any ordinary water in sufficient quantities to be effective clarifying agents. Hence hard water is clear, soft water is inclined to be muddy. Similarly running water, which incidentally is mostly harder than still water, will mechanically wash away clay put in suspension by some casual disturbance; in still water it has to fall to the bottom by natural sedimentation, which may be, in soft water, an almost infinitely slow process. The contrast, therefore, is very marked in this respect between water which is both hard and running, such as our river, and that which is at once soft and still, as in our ponds. The water of the river and its appendages contains generally rather more than 100 milligrammes of calcium per litre (about 25 degrees of hardness); the ponds vary from 10 to about 90, the average of the 72 which have been examined being 45 milligrammes (about 11 degrees). The lakes have quite soft water (25 milligrammes), and the water is never clear; though a fair volume of water is always passing through, there is continual disturbance from wind, from birds and from those who t their pleasure in boats and the expectation of fish.

Muddiness may affect mollusca in several ways. A gross degr may be reasonably expected to choke them mechanically, especial in respect of their respiration and chiefly if respiration is branchia Such a degree is, however, the exception in the Aldenham ponds, an I suspect that the main effect of the opacity which is commonly pr sent in the closed ponds is due to the cutting off of light. If so mollusca are presumably affected indirectly, through the influence o defective lighting on the vegetation. Muddy ponds show general few or none of the ordinary water plants; the plants which are o immediate moment to snails as food are probably algæ and suchlik many of which are epiphytic on the higher plants and which are i any case similarly affected by light. Moreover the absence of ad quate illumination means that the plants will not perform the function of oxygenating the water. How little muddiness is necessar to obstruct the growth of plants is well shown if two jars are sow with fragments of *e.g. Elodea* and the one rendered slightly perma ently muddy by the addition of a little clay shaken up in water; in few weeks the plant in the muddy water has wilted away, in the othe has shown active growth.

Of the 27 closed ponds which contain no snails, in five "muddy is noted as the presumptive cause. The influence of lighting is als illustrated by the fact that ten more are entered as "shaded by trees, and four others as "partly shaded."

(3). Closed ponds are further disadvantageously placed as regard *foulness*. The exaggerated natural effect is best seen in ponds i woods with the floor covered with "trash," as the American limno logists call it, of dead leaves, twigs, etc. Such ponds contain neithe plants nor snails. The absence of plants means deficiency of oxyge and such decomposition as goes on will be on anærobic lines, producing various foul-smelling and probably more or less acid and poisonous substances from dead organic matter. With free oxygenation decomposition is more rapid and complete, and leads to beneficial results in the way of the production of plant food. But even with the most ample illumination, running ponds and rivers must have the advantage over closed ponds in the way that "trash" is mechanically removed and, especially in winter, the whole water area is liable to be scoured out with floods. Foul mud is commoner than foul water, so that the point may have special reference to bivalves, particularly *Anodonta* and *Unio* in their early stages.

(4). As regards *food*, closed ponds are at an obvious disadvantage owing to their limited collecting grounds. Any ordinary small pond contains plenty of calcium for large colonies of heavy *Anodonta* shells, though it may well be that a superabundance is advantageous. It is possible, though unlikely, that there is a directly limiting factor capable of crude chemical expression, *e.g.*, copper, manganese. The supply of oxygen is hardly of direct importance for pulmonates; for the bivalves, operculates and such species as *Ancylus fluviatilis*, it must be a paramount consideration. Oxygenation depends partly on the movements of the water, partly on the respiratory processes of plants, and, as concerns any one group of animals, on the presence of organic matter, live or dead, which competes for what oxygen is available. We are badly in need of definite analytical data on the gaseous contents of closed ponds.

We may here note that an analysis of our local records, taking closed ponds as forming a tolerably homogeneous group, indicates the close association between snails and plants. On the average, ponds with no snails show 1·7 sorts of the larger water plants, and both numbers increase together till the figure for ponds with five or more sorts of snails reaches 5·4 sorts of plants. This is a sadly meagre quantitative measure, but there is enough evidence to show that the correlation will prove a fruitful study in many ways. Thus the fauna of drying ponds may be determined by the consequent destruction of plants as much as by the capacity of snails themselves to withstand dessication.

(5). *Biological factors* crudely fall into the two divisions of food and enemies. We know practically nothing of either. There are grounds for thinking that water snails feed on the larger plants as little as do land snails, and that algæ and other small things form their main diet, though their relation to the higher plants is likely to be altered when these are partially decayed. Of any demands made by particular sorts of snails for particular kinds of food we know nothing. One of the most deplorable lacunæ in our knowledge of how the world is made is the causation of the natural mortality of live things; we are indeed mostly ignorant of whether and when they die or live, except in the roughest qualitative fashion. It would be impossible to overestimate the value of precise quantitative reasons for the fact that our ponds are not solid with snails.

Summarising the discussion of the inferiority of closed ponds, it seems that two pretty definite factors can be disentangled—the supply of oxygen and the opacity of the water. The former may be presumed to account in some measure for the habitats of *Ancylus fluviatilis*, *Physa fontinalis*, *Planorbis contortus*, perhaps *Pisidium amnicum*, and experiment shows that these species die away in jam-pot aquaria very quickly in comparison with *e.g.*, *Planorbis spirorbis* or *P. albus*. The latter is a definite factor of more general application to the superiority of running over still water.

(*c*). Lastly we have two species which are most frequent in stil water. *Planorbis nautileus* is in 40 of 86 closed ponds, in 7 of 2: running ponds (five of which are running only in the winter) and nowhere else; *Sphærium lacustre* occurs only in 16 closed ponds an in two winter running ponds. Both species are so common that th question of dispersion can be reasonably neglected as a preliminary though the possibility of a dispersive agent with a selective taste fo still water has to be noted. We seem in fact to have two specie which prefer loci more or less inimical to other mollusca. Simila occurrences are sometimes attributed to the inability of the specie occupying generally unfavourable habitats to occupy more advantageous positions owing to the competition of more powerful kinds; th weaker species are thus driven into the œcological slums. Howeve true this concepton may be in the case of plants and of animals whos limiting factor of abundance is food, one must, I think, be cautiou of using it too freely. If we try to reduce the general idea to definite imagery of what is happening in the special case of the mo lusca we are considering—if we consider whether what we know o the economy of the mollusca does not suggest that the prevalen populations are as probably determined by an abundance of enemie as by a deficiency of food—if we wonder why 26 species should b able to flourish abundantly together in the large river backwater, an should yet by something they think or do in drawing a line of qualit be able to exclude two further species belonging to genera alread represented—this idea of competitive seclusion seems unattractive Be it noted too that the evidence that *lacustre* and especially *nautileu* do not occur in favourable localities is not really so good as the ind cations that they are found in unfavourable loci. If the former i actually the fact, the natural surmise is that some relatively destruc tive agent, more probably biological than physical or chemical, i prevalent in favourable places; if the latter, it is clear that they ar adapted to withstand bad conditions in ways which with fuller information are probably capable of analysis. The comparison of *P. amnicum* *S. corneum* and *S. lacustre* should be particularly instructive.

Such in very brief outline is the topic which requires our curiou and careful consideration. Several groups of important habitats an many species of interest have not been mentioned because they ar not represented locally. Peaty waters for example have special conditions of fauna and flora; marshes, canals (of all habitats apparently the richest) and natural lakes require attention. The rare species (*A. glutinosa*, *P. glaber*, *S. lineata*, *Sph. ovale*) are of special interest;

they are widely dispersed and far from common, that is they are rare rather than local. What is the particular kind of habitat which they require? Is *Neritina* dominated by the oxygen supply, as attempts to keep it in confinement would suggest? Is the occurrence of *margaritifera* conditioned by the relative absence of lime? It is evidently easier to ask questions than to answer them.

The solution of these problems may be approached along two lines. First, both in time and importance, we want to clearly know the facts. What is true of one locality does not necessarily hold in another, and an adequate experience is beyond the range of the most leisured observer; co-operation is essential. Definite lists of species found in defined loci will soon give some of the general rules which we seek to find, as, for example, what species commonly live together. The "well known association of *Pl. spirorbis* and *P. hypnorum*" illustrates the need for precise data. At present the idea rests on impressions; the presence or absence of a real association can be based only on a knowledge of the numbers of loci—(1), with *Pl. spirorbis*, (2), with *P. hypnorum*, (3), with both, (4), with neither. Systematic surveys of districts in which all water units are examined would be still more valuable. In trying to define what sorts of habitats are favoured by what sorts of snails, it is difficult to say just what other data should be taken; experience alone will indicate. It is impossible to observe everything, but as a preliminary a statement of (*a*), the general physical nature of the locus, size, depth, character of water, still, permanently running, temporarily running, etc., (*b*), the more obvious plants present, and (*c*), any animals (*e.g. Gammarus*), algæ, etc., which the observer happens to be able to identify, will probably suffice to give a tolerably good idea of the general facies and characteristics. Especially to be avoided is that curse of the human mind —to pay attention to the rare and exceptional to the exclusion of the common and normal; we must discover the everyday rules before we can hope to explain the exceptions.

Secondly, in supplement and suggested by these observations, experimentation is wanted in the field and under artificial conditions. The transplantation of species from one natural locus to another within the same district will not, I hope, offend the most sensitive geographer; experiments on the capacity of the different species to live in various artificial environments will throw light on their relation to aeration, muddiness, food, calcium salts, decaying vegetation, other animals and the like. By this means alone can the various factors be dissected. We must not, however, be too quick to assume that our experiments will give answers which can be translated directly to field experience. The bits of seashore and heath which live in botanical gardens are enough to warn us that human interference may upset pretty completely for our snails the infinite complex in which they live and move and have their being.

Much help in the examination of the waters has been gratefully received from E. W. Bowell, J. A. Boycott, and A. A. Whitaker. The data relating to *Pisidium* are wholly due to C. Oldham, who has identified all our material; I know about them only enough to appreciate the skill and labour that he has been good enough to spend on them. My thanks are also due to the many naturalists whose observations I have freely used without acknowledgment.

* * *

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

464th Meeting, held at the Manchester Museum, Sept. 12th, 1917.

Mr. R. Standen in the chair.

Donations to the Library announced and thanks voted:

From Messrs. C. Hedley, J. C. Melvill, R. Standen, J. W. Jackson, P. Ba[illegible]sch, H. H. Bloomer, H. Overton, Y. Hirase, and Miss A. L. Massy.

Donation to the Cabinet announced and thanks voted:

Physa acuta from Hendon, from J. E. Cooper.

New Members Elected.

Harry Sowden.
Joseph G. Kitchen.

Candidate Proposed for Membership.

H. P. W. Giffard, B.A., B.Sc., F.G.S., 103, Ebury Street, S.W. 1 (introduced by J. C. Dacie and J. E. Cooper).

Resignations.

Henry Laver; Edward Step; Bertram Pickard; and Miss E. M. Norton.

Paper Read.

"*Physa acuta* Drap. in Middlesex," by J. E. Cooper.

Exhibits

Were made by Messrs. J. E. Cooper, W. H. Davies, J. W. Jackson, and Mrs. [illegible]

It was decided to have the following **Special Exhibits**:

November 14th - - *Chloritis.*
December 12th - - *Camæna.*

465th Meeting (Annual Meeting), held at the Manchester Museum, October 13th, 1917.

Mr. John W. Taylor in the chair.

The following members and friends were present:—

Messrs. R. Standen, J. R. Hardy, G. C. Spence, J. W. Jackson, J. R. le B. Tomlin, B. R. Lucas, E. Collier, E. D. Bostock, Thos. Hey, W. Denison Roebuck, J. G. Kitchen, W. H. Davies, F. Taylor, E. R. Brown, G. Fysher, J. Morley, C. H. Moore, Mr. and Mrs. G. H. Taylor, and Mr. and Mrs. Gill.

Donations to the Autograph Collection announced and thanks voted :—

John Emmet, J. Haggar, W. F. de V. Kane, J. E. Harting, R. Charles, H. Crowther, F. R. Fitzgerald, R. Howse, J. McMurtrie, and George Roberts. Donor : W. Denison Roebuck.

Donations to Cabinet announced and thanks voted :—

Neritina fluviatilis (large form) from Sharpness Docks, from Chas. Upton. Also a number of voucher specimens, per the Hon. Recorder.

Appointment of Auditors.

Messrs. F. Taylor and C. H. Moore were re-appointed Auditors.

Appointment of Scrutineers.

Messrs. G. C. Spence and C. H. Moore were appointed Scrutineers.

New Member Elected.

H. P. W. Giffard.

Candidates Proposed for Membership.

J. H. Adams, Lemain, Looe, Cornwall (introduced by C. P. Hurst and R. Standen).

Wm. H. Whitelock, Rosedale, Westbourne Road, Edgbaston, Birmingham (introduced by J. R. le B. Tomlin and J. W. Jackson).

Resignation.

Thomas Scott.

Members Deceased.

Albert Wood.

James Crawford.

Members Struck Off the List (Rule IV).

W. R. Butterfield, E. Dupont, J. Laycock, A. J. Moore, R. Murdoch, P. B. Nash, V. V. Ramanan, J. B. Rosevear, T. Taylor, Rev. R. E. Thomas, and R. Woodcock.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1917-1918 had been unanimously elected as nominated by the Council (see p. 225).

Papers Read.

"On the Recent Misapplication of the Names *Pisidium nitidum* and *P. pusillum* of Jenyns," by A. W. Stelfox, M.R.I.A.

"On a Colony of *Cochlicopa lubrica* Müller," by the Rev. S. S. Pearce, M.A.

"The Land and Freshwater Mollusca of Audruicq, Pas-de-Calais," by J. W. Taylor, M.Sc.

"*Limax cinereo-niger*, its Variation in Savernake Forest, and Description of a New Variety," by W. Denison Roebuck, M.Sc.

"Discovery of *Limax tenellus* in the New Forest," by W. Denison Roebuck, M.Sc.

Presidential Address.

Dr. A. E. Boycott, F.R.S., who was unable to attend the meeting, sent a most interesting address on "The Habitats of Freshwater Mollusca."

A cordial vote of thanks was passed to the President for his address.

The Society's best thanks were also voted to the authorities of the Manchester Museum for permission to hold meetings on their premises.

Exhibits.

By Mr. C. H. Moore: A collection of forty-six species of non-marine shells obtained within four miles of the Stalybridge Town Hall.

By Mr. J. W. Jackson : Local non-marine mollusca, and photographs of habitats of certain species.

By Mr. R. Standen : Very fine locality sets of the zebra mussel (*Dre polymorpha*) ; also *Aporrhais serresianus*, and *Cassidaria*, from Tearagh Ireland).

By Mr. B. R. Lucas : Non-marine shells from Northwich, Cheshire, an send, Yorks. ; also shells of the genus *Clavator*, etc.

By Mr. J. F. Musham : Shells, crustacea, and insects found in the cre logwood, from Jamaica, at the Yorkshire Dyeware and Chemical Co.'s w Selby.

By Mrs. Gill : *Unionidæ* from China, Japan, and the United States ; *A ellidæ*.

By Mr. G. C. Spence : Various *Stenogyridæ*, and abnormal specin *Achatina*.

By Mr. W. H. Davies : Freshwater shells of the Manchester district.

By Mr. E. Collier : An extensive collection of *Labyrinthus* and other *H*

By Mr. J. D. Dean : A book of coloured drawings from life of the *Zonitidæ*.

By Mr. J. R. le B. Tomlin : *Latiaxis fortunei* A. Ad. from Hongkong *trainea indica* Smith from the Gulf of Manaar in 597 f. ; and very fine e of *Marginella bellii* Sow., *M. elegans* Gmel., and *M. kieneriana* Petit.

By Mr. A. W. Stelfox : Specimens and drawings of *Pisidium* to illust paper, including examples labelled "*P. pusillum*" and "*P. nitidum*"—"F Mr. Jenyns to W.T.," exhibited by permission of the Curator of the Municipal Museum. These were sent to William Thompson by Jenyns, a found in the collection of G. C. Hyndman, a close friend of Thompson's, in Hyndman's writing.

Selections were also shown from the Society's cabinet, chiefly ex coll. Oldham.

ANNUAL REPORT.

THE present is the forty-first Annual Report of the Society. Since our last meeting we have lost five members by death, and seven by resignation, m total loss of twelve. Ten new members have been elected, our membersl standing at 309, including ten Honorary Members. The names of severa bers have been submitted to the Council with a view to being struck off by reason of non-payment of subscriptions (*vide* Rule 4), but the Cou withheld action in the matter in the hope that most, if not all, of the subsc will be forthcoming before the end of the year.

The Council would call emphatic attention to the matter of subscriptions Society has been put to considerable loss and inconvenience by the ne members to forward their subscriptions as they become due.

The deaths that the Society has to deplore are those of the Rev. L. J. S ford, who passed away in April last, after a long and severe illness ; th Prof. H. M. Gwatkin, D.D., M.A., a former President of the Society leading authority on molluscan radulæ ; Mr. E. G. M. Sturt (Middlesex Reg killed in action last year ; Dr. H. F. Becker ; and Mr. A. Wood. The also learns of the recent death of Dr. Henry Laver, a former member.

Obituary notices of the Rev. L. J. Shackleford and of Dr. H. F. Beck already appeared in the *Journal of Conchology*. Mr. Shackleford bequeathed collection of *Marginellidæ* to the Manchester Museum, where they are a for study by the members of this Society.

The usual monthly meetings have been held at the Manchester Museum, and, notwithstanding the adverse circumstances caused by the war, they have been fairly well attended, and great interest has been shown in the general and special exhibits. Of the latter, the following groups have been dealt with and discussed: *Helicophanta*, *Rhysota*, *Ariophanta*, *Obba*, *Vitrina*, and *Helicarion*.

Some twenty-six papers and notes have been read, some of which have already been printed in the *Journal*, including obituary notices of Mr. E. A. Smith and Mr. J. Ponsonby-Fane, whose deaths were mentioned in the last Annual Report.

Owing to the increased cost of paper and of printing, caused by the war, the Council has deemed it advisable to curtail the issue of the *Journal*, and decided that, for the present, only three numbers per annum should be published. The Council has also decided that all authors wishing to have illustrations to their papers must be prepared to meet the expense of the same.

The Council again desires to express its high appreciation of the important services rendered to their country by members of the Society in both the Army and the Navy, and to wish them a safe and speedy return.

RECORDER'S REPORT.

THE Hon. Recorder reports that the work of record and registration has been steadily carried on, thanks to the public spirit and kindness of numerous members and other observers. Steady progress is being made with a view to the publication of the Census up to date, in accordance with a circular issued by the President, to which there was a good financial response to cover the cost of printing. The Hon. Recorder wishes, however, to appeal strongly to all workers to let him have their full assistance. There are doubtless numerous specimens both in public and private collections which would fill up blanks. More particularly is this the case with regard to Ireland, and the Hon. Recorder would be grateful to all Irish workers who would respond to this appeal. He is publishing at intervals in the "Scottish Naturalist" authenticated lists for various counties, of which those for Easterness, Elginshire, Main Argyll, Wigtownshire and Kirkcudbrightshire have already appeared. He is willing to do this for English, Welsh, and Irish counties if suitable journals are available.

TREASURER'S REPORT.

Statement of Accounts for the Year 1916.

RECEIPTS.	£	s.	d.	EXPENDITURE.	£	s.	d.
Cash in hand ...	11	11	8	Cost of Journal for Oct., 1915	14	19	9½
Subscriptions received ...	36	15	9	,, ,, ,, Jan., 1916	12	16	1
Life Composition Fee ...	3	3	0	,, ,, ,, Apr., 1916	12	3	1½
Sale of Publications	0	15	10	,, ,, ,, July, 1916	13	0	1
Advertisements	2	10	10	Cost of Illustrations	7	10	0
Due to Treasurer	24	10	2	Reprints	6	7	6
				Stationery	3	19	0
				Subscription to Malacological Society	0	10	6
				Secretary's Expenses	6	10	2
				Editor's ,, ...	0	11	3
				Recorder's ,, ...	0	19	9
	£79	7	3		£79	7	3

Interim Statement of Accounts to October 13, 1917.

RECEIPTS.	£	s.	d.
Subscriptions	83	0	0
Two Life Composition Fees	6	6	0
Donations towards Cost of Illustrations—			
R. Bullen Newton ...	2	10	0
E. Collier	1	0	0
Advertisements	1	0	0
Sale of Publications	2	3	9
	£95	19	9

EXPENDITURE.	£	s.	d.
Balance due to Treasurer	24	10	2
Cost of Journal for Oct., 1916	12	10	8
,, ,, ,, Jan., 1917	13	0	2¼
,, ,, ,, Apr., 1917	15	4	7¾
Reprints	8	16	0
Stationery	0	6	0
Taylor's Monograph, parts 21 and 22	0	10	6
Editor's Expenses...	1	0	0
Recorder's ,, ...	2	4	4
Treasurer's ,, ...	3	1	0
Secretary's ,, ...	5	12	4
Cash in hand... ...	9	3	11
	£95	19	9

Outstanding Liabilities: £15 12s. 3d.

Subscriptions for 1917 still unpaid amount to £20 15s. 0d.

Arrears of Subscriptions about £40—of which one-third might be considered good.

ANNUAL REPORT OF THE LEEDS BRANCH.

TEN meetings have been held during the year. Four in the field, viz., at Agbr in April; Kirkstall to Calverley in May; a second visit to Agbrig in June; a at Collingham Bridge in September. Six meetings have been held indoors: thr in the University, Leeds, and three at Bradford.

One meeting was given up to an exhibition of mollusca to show variation species; while a second meeting was devoted to a general display of mollusca.

Three papers were read during the session: one by Mr. A. Hartley on t genus *Placostylus*; a paper was given by the President, Mr. J. A. Hargreaves, his experiences as a collector during the past thirty years. His reminiscences collectors he had met or corresponded with, and his varied experiences in exchan ing specimens, were amongst the very many phases dealt with. A third pap was read by Mr. J. F. Musham on Some Species of the Genus *Vivipara*.

The exhibits at the winter meetings have been many and varied. One exhi was of special interest—that of our member, Lieut. C. T. Cribb, collected in t few leisured hours available during the trying conditions of military life in the d trict of Audruicq, Pas-de-Calais. Mr. J. W. Taylor has written a full report this collection.

The 12th October, 1916, being the fortieth anniversary of the birth of t Conchological Society of Great Britain and Ireland, Mr. W. Denison Roebu commemorated the event by having reprints from a photograph taken in 1899 the four founders and presenting to each member a copy.

Our membership is twenty-four, with three corresponding members. Mr. J. Hargreaves is our President.

F. BOOTH, *Hon. Sec*

THE
JOURNAL OF CONCHOLOGY.

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OBITUARY NOTICE:
ERNEST DAVID MARQUAND, M.A., A.L.S.

By J. R. LE B. TOMLIN, M.A.

It is with very deep regret that we have to record the death of one of our oldest members, E. D. Marquand, who passed away very peacefully at Totnes, on February 16th last, a very few days after his seventieth birthday. Mr. Marquand had been an active member of our Society since 1885, and was an admirable all-round naturalist; he wrote with equal facility and knowledge on botany, entomology, and conchology, and formed very complete British collections in all of them, the Cryptogamic Herbarium being especially fine. The mollusca, as well as certain other groups, remain in his son's possession.

Born in Guernsey, on February 8th, 1848, he was educated at one of the large public schools in New York. On returning to England after his father's death, he went through the usual course of training for the law, and for several years held the post of confidential secretary to a leading London firm of solicitors.

He was, however, always a passionate lover of the country, and, abandoning his profession in 1876, went with his mother and brother to live at Brockenhurst, his life henceforward being entirely devoted to the study of natural history. Here he spent three years, studying the fauna and flora of the New Forest, and compiled a list of Phanerogams, which was subsequently embodied in Townsend's "Flora of Hampshire." In 1879 the family moved to Penzance, and here Marquand enjoyed the intimate friendship of two well known Cornish botanists—John Ralfs and William Curnow. He became a Director of the Town Library, and Hon. Secretary of the Penzance Natural History Society, to whose Transactions he contributed many papers, mainly on entomology, which at that time formed his chief study.

Seven years later he moved to Alphington for a short time, and then, after spending a year abroad, settled down once more in Guernsey in the autumn of 1888. Marquand devoted the next seven or eight years to a steady and unremitting investigation of the local flora, which ultimately resulted in the publication of his "Flora of

Guernsey and the Lesser Channel Islands" in 1901. This admirable monograph of some five hundred pages includes fungi, lichens, mosses, algæ, and diatoms, and gives separate lists for each of the islands explored.

In 1896 he married Miss G. E. Holey, and moving to Richmond, Surrey, took up work at the Kew Herbarium and with the Linnean Society. In 1899 we find him in Alderney, and four years later again in Guernsey. In 1910 the family migrated abroad for a considerable time, and on returning to England lived successively at Bedford, Oxford, Cambridge, and finally at Totnes.

He was associated with many learned societies, and was an ex-President of the Guernsey Society of Natural Science, Associate of the Linnean Society of London, Corresponding Member of the Soc. des Sciences Naturelles et Math. de Cherbourg, of the Soc. d'Archéologie d'Avranches (in recognition of his 'Essay on the Guernsey Norman Dialect and its Patois Plant Names') and of the Cardiff Naturalists' Society.

Two species of plants were named after him—*Verticillium marquandii* Massee (a fungus), and *Salvia marquandii* Druce (a Guernsey species).

The following papers of his have appeared in this *Journal*:—

"Land and Freshwater Mollusca of South Devon," *Journ. Conch.*, vi., p. 136.

"*Pupa ringens* in Guernsey," *Journ. of Conch.*, vii., p. 44.

"Land and Freshwater Shells of the Channel Isles" (in collaboration with the writer), *Journ. of Conch.*, x., p. 285.

"Imperforate *Haliotis tuberculata*," *Journ. of Conch.*, xi., p. 48.

"New Records for Bedfordshire," *Journ. of Conch.*, xiii., p. 339.

"*Vertigo substriata* in Guernsey," xiv., p. 91.

Other papers on mollusca are:—

"The Land and Freshwater Mollusca of Cornwall," Transactions Penzance Natural History Society, 1884.

"Our Common Garden Snails and their Variations," Transactions Penzance Natural History Society, 1889.

"The Land and Freshwater Shells of Guernsey," Transactions Guernsey Society of Natural Science, 1894.

"Additional Land and Freshwater Shells for Guernsey," Transactions Guernsey Society of Natural Science, 1896.

"The Marine Shells of Guernsey and the Lesser Channel Islands," Transactions Guernsey Society of Nat. Sci., 1901.

"Synopsis of the Recorded Fauna and Flora of the Sarnian Islands," Transactions Guernsey Society of Nat. Sci., 1904.

LIMAX CINEREONIGER, ITS VARIATION IN SAVERNAKE FOREST, AND DESCRIPTION OF A NEW VARIETY.

BY W. DENISON ROEBUCK, M.SC., F.L.S.

(Read before the Society, October 13th, 1917).

ON the 2nd September, 1917, Mr. Charles Oldham investigated Savernake Forest in Wilts North with remarkable success as regards this species, which was in great abundance and remarkable variation in colour and markings. There were no less than eight distinct varieties, named or nameable, in the consignment he sent me, and he remarked that shortage of tins alone prevented him from doing more than select the most conspicuous forms. One, a half-grown example of var. *cinereo-nebulosa*, is a striking form which I have not seen before, and which I have sent to the British Museum for permanent preservation. There were two adults of var. *strobeli*, two adults of the well-known var. *luctuosa*, a half-grown example of var. *vera*, very young specimens of var. *maura* and var. *efasciata*, and there were also two forms which cannot be identified with those described in Taylor's Monograph. One has the markings of var. *vera*, and the other of var. *interrupta*, but in each case the colour is brown and not as in the descriptions of those two forms.

For these I propose a new variety as follows :—

Limax cinereoniger var. **brunnea** nov. Colour brown, both as to ground-colour and markings.

This varietal name applies to colour only, and is applicable in conjunction with any other varietal name. Thus in the present instance, there were two examples, one very young, and one about a quarter-grown, with the two bands of var. *vera*, and which are, therefore, var. *brunnea + vera* ; and two, one half-grown and one a quarter-grown, with the same two bands broken up into numerous elongated spots and aspersions, the markings of var. *interrupta*, and these are, therefore, var. *brunnea + interrupta*.

Some of the other slugs obtained by Mr. Oldham at the same time are also interesting. Not to speak of the ordinary forms seen of *Agriolimax agrestis* and *Arion hortensis*, *Limax maximus* was represented by its varieties *cellaria*, *fasciata*, *obscura*, and *ferussaci*, *L. arborum* by its type and var. *bettonii*, *Arion ater* by its varieties *livida*, *plumbeo-pallescens* and *brunneo-pallescens*, and *Arion subfuscus* by its varieties *rufo-fusca*, *cinereo-fusca*, and *fuliginea*.

Altogether this Savernake Forest consignment is a most remarkable one, and speaks volumes for that locality as a collecting-ground.

ON THE PISIDIUM NITIDUM AND P. PUSILLUM OF JENYNS: A REPLY.

By B. B. WOODWARD, F.L.S., &c.

(Read before the Society, February 13th, 1918).

It is an exceedingly old forensic and debating manœuvre to misstate a case for the sake of more easily demolishing one's opponent.

Quite unintentionally, of course, this is the method adopted by Mr. Stelfox in his paper recently read before this Society (*Journ. of Conch.*, xv., 1918, pp. 235–239). Therein (p. 237) he gives a figure of a specimen from the "Hyndman Collection" in the Belfast Municipal Museum of a *Pisidium*, which he states to be "*Pisidium nitidum* Jenyns (=*P. pusillum* (Jenyns) B. B. Woodward)." The first half of this statement is perfectly correct, the second entirely false. Judged by the drawing, which is obviously very good, this example further confirms the conclusions I had drawn from the specimens at Bath and from the precisely similar example which Jenyns sent to Forbes and Hanley to figure in their great work. It does not resemble my idea of what should be selected as the *P. pusillum* of Jenyns in the least, and Mr. Stelfox has not the smallest warranty for saying that it does.

As regards the question of *P. pusillum*, Jenyns' species was a composite like his *pulchellum*, and, as his later paper (Ann. and Mag. Nat. Hist., ser., iii., vol. ii., 1858, pp. 104–107) shows, most of his other species. The idea of a "type" in its modern conception had not been evolved in Jenyns' time, and for *pusillum* he figured "two extreme varieties" (Trans. Camb. Phil. Soc., iv., 1832, p. 312), and not one example, as would be inferred from the notes of Mr. Oldham, quoted by Mr. Stelfox. One of these (fig. 5) as I pointed out (Cat. Brit. *Pisidium* p. 7) would probably if opened prove to be *P. personatum* Malm. From an inspection of Jenyns' own collection, from his later paper, and from specimens in my own and other collections, traceable more or less directly to Jenyns, it is obvious that he had also identified as his *P. pusillum* specimens of *P. casertanum* f. *lacustris*. Eliminating this last and the *P. personatum* of Malm, there remained a well-marked form, which as next reviser I selected as his *P. pusillum*. This species as identified by me, Dr. Nils Hj. Odhner, of Stockholm, informed me, shows a peculiarity in its gill-structure in both deep and shallow water forms. It was unfortunately not possible to quote this fact in my "Catalogue" because Dr. Odhner intended to publish it himself. Publication has, of course, now been deferred, but his interesting results will, it is to be hoped, yet see the light of day. *P. pusillum*, as I understand it, is common in Ireland, and especially fine in the shell-marl deposits. That Mr.

Stelfox cannot recognise it is no proof that it is not a well-marked form, and further research may not impossibly cause him to change his views, especially if, distrusting the unaided eye, he will make use of the microscope, without which instrument no work in this difficult and puzzling group is possible.

"Superficial views" are notoriously fallacious, and have been the cause of all the confusion in the study of this group in the past. "It looks like" is not sufficient to-day unless supplemented by a careful microscopical examination of the hinge characters.

Complaint has also reached me, from various sources, that some of my past determinations, on comparison, will not always agree with later ones. It would be surprising if they did. So soon as it became known that I was working at the group, and before I had been able really to settle the various forms, my aid in determining specimens was invoked, and with more wishfulness to oblige than, perhaps, wisdom, I complied. Many hours did I devote to various gatherings received from different correspondents; but, naturally, many of these early determinations have proved to need revision. Papal infallibility was never claimed for them, and many correspondents have courteously, when in doubt, referred such doubtful cases back to me.

Otina otis Turton **at St. Mary's, Scilly.**—Looking over the catalogue[1] of Scilly Islands Marine Mollusca collected a good many years ago by the Revds. R. W. J. Smart and A. H. Cooke, I noted but one locality given for the interesting little species *Otina otis* Turt., viz.: "Piper's Hole, Tresco I." This is a cavernous recess, somewhat after the fashion of the famous Gouliot Cavern, Sark. Although it is now almost fifty-one years since I visited the Scilly Isles, in company with my friend, the late Mr. Jonathan Rashleigh, of Menabilly, Cornwall, I still have a clear memory of the abundant collecting of this local species on rocks left bare by the receding tide off that part of the shore of St. Mary's just north of High Town, which I believe would be included in "Porthloo Bay." The Island of Tresco, where is situate the domain of the Lord of the Scillies (Mr. T. A. Smith-Dorrien-Smith), with its wonderful tropical gardens and ruined abbey, is about a mile and a half from this spot. I collected all round Tresco in 1866, but found no sign of the *Otina* there. It was everywhere in Porthloo Bay, associated with huge *Patellæ*, *Balani*, *Mytili* (*M. edulis* var. *ungulatus*) and *Lasæa rubra* Mont. Here *Otina otis* might be reckoned in hundreds, the *Lasæa* in countless thousands. I never saw these last so abundant elsewhere, the var. *pallida* occurring more rarely. *Alexia bidentata* Mont. was likewise present. In Smart and Cooke's list *Lasæa rubra* is only mentioned as occurring at "Golden Bell Bar," and its variety "on rocks under Connell's Castle." As these enthusiastic collectors only found *Otina* at the "Piper's Hole" locality, to quote their own words, "after many days' searching along the rocks, thus being at last rewarded," I think this short note may merit publication. I may add that on the grassy margin of this bay, the curious pink-flowered Townsend's Trefoil (*Trifolium repens* L. var. *Townsendi*) was abundant, and I found two specimens of the rare beetle *Gnorimus nobilis* on its flowers.—J. COSMO MELVILL (*Read before the Society*, May 9th, 1917).

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[1] *Journ. of Conch.*, iv., p. 301, 1885.

THE CLAUSIUM IN ALOPIA, A SUB-GENUS OF CLAUSILIA.

By J. DAVY DEAN,
Of the Department of Zoology, National Museum of Wales.

(Read before the Society, March 14th, 1917).

PLATES 5 AND 6.

INTRODUCTION.

THE study of the clausium in *Clausilia* appears to have received but scant attention from English writers. The best account I have seen is the one in Dr. Gray's edition of Turton's Manual,[1] in which the British species are classified according to the character of the clausium. Lovell Reeve,[2] writing a few years later, describes the clausium as a calcareous appendage or spoon-shaped lamina conforming to the contour of the aperture, but he does not enter into specific differences. Of modern writers, perhaps Mr. John W. Taylor deals most prominently with the clausium of the British species, but I have not been able to find anywhere detailed comparisons with continental types or forms without which a thorough understanding of our own species seems impossible. In this connection a study of the clausium in *Alopia* has a relative importance. Indeed, it is almost indispensable.

Dr. Gray's classification of the British species of *Clausilia* is as follows :—

a. Clausium notched at the tip, fitting into a plait on the outer lip of the shell ; shell smooth (*Marpessa* Gray).
    1. *Clausilia bidens* (Müller) (= *laminata* Montagu).
b. Clausium entire at the top ; shell corrugated (*Iphigenia* Gray).
    2. *Clausilia biplicata* (Montagu).
    3. *Clausilia rolphii* Gray.
    4. *Clausilia nigricans* (Maton and Rackett) (= *bidentata* Ström).

Kobelt in his Catalogue of European Land and Freshwater Mollusca,[3] divides *Clausilia* into twenty-seven sections, including *Alopia* ; whilst Dr. Westerlund in the "Monographia Clausiliarum"[4] gives twenty-three sections. I have examined species in the greater number of these sections, and am convinced that the presence of the notch indicates an important phase in the development of the clausium. The "entire" clausium is the prevailing type, and its purpose is to close the aperture of the shell completely. The notched type may correspond in function to the imperfect epiphragm noticed in many of the *Helicidæ*, for the purpose of the notch is *to provide a minute orifice*, circular in shape, formed in part by the lobes of the clausium, and completed by the curve of the plica-lunata.[1]

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[1] Manual of the Land and Freshwater Shells of the British Islands, by William Turton : revised edition by Dr. Gray, 1857.

[2] Land and Freshwater Mollusks, by Lovell Reeve, 1863.

[3] Catalog der im europäischen Faunengebiet lebenden Binnenconchylien von Dr. Wilh. Kobelt, 1881.

[4] Monographia Clausiliarum in regione Palæarctica Viventium, scripsit Dr. Carl Agardh Westerlund, 1878.

This remarkable type of clausium has been noticed only in *Alopia*, *Clausiliastra* (=*Marpessa*), and in one species of *Herilla*—*Clausilia dacica* Friv. It is probable also, with the exception of *Triloba*, which I have not up to the present had an opportunity of examining, that the other type, the "entire" clausium, will be found to obtain throughout all other sections of the genus. My description and illustration of the most characteristic forms of clausium will shew this more fully.

BILOBATE.—Clausium with two lobes, much resembling a pointing hand, with finger and thumb extended. Restricted to *Alopia*. Plate 5, figure 1.

EMARGINATE.—Clausium deeply notched near the base, on the lower or outer margin. Restricted to *Clausiliastra* and *Herilla*. Plate 5, figure 2.

REFLEXED.—Clausium entire, but with the lower margin bent back, giving a folded appearance, as in *Siciliaria*, *Medora* and *Garnieria*. Plate 5, figures 3 and 4.

INFLEXED.—Clausium bent inwards, and the base raised in the form of an arch, as in *Stereophædusa* and *Alinda*. Plate 5, figures 7 and 8.

ROSTRATE.—Clausium narrowing towards the base, which is thickened and has the appearance of a beak, as in *Idyla*. Plate 5, figure 5.

TRUNCATE.—Clausium oblong in shape and square at the base, conspicuously truncate at the junction of the spatula with the pedicle, as in *Pirostoma* and *Papillifera*. Plate 5, figure 6. Also in *Stereophædusa*. figure 7.

CLAVATE.—Clausium narrow at the top, becoming broad or club-shaped at the base, as in *Nenia* and *Böttgeria*. Plate 5, figure 9.

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[1] Smith and Woodward, On the Nomenclature of the Oral Folds in the Shells of *Clausilia*. Ann. Mag. Nat. Hist., March, 1890.

REMIFORM.—Clausium somewhat truncate, produced at the base, much resembling the base of an oar, as in *Megalophædusa.* Plate 5, fig. 10.

In order to compare specific differences in the clausium, it seems to be necessary to establish terms for the different parts. The most characteristic aspect of a clausium is the *internal* one. The point of juncture with the columella may be called the *proximal* end; the base, the *distal* end. The term pedicle is familiar, and signifies the narrow elastic filament which encircles the columella. The lower broader portion I would term the *spatula.* The *inner margin* of this is that side of the spatula which, in the closed position, lies nearest to the columella, and which in *Alopia* and *Clausiliastra* terminates at the base in the *inner lobe.* The *outer margin* is the opposite side, much shorter in extent, terminating in the *outer lobe* in *Alopia,* and interrupted by the notch or *orifice* in *Clausiliastra.* Plate 5.

ALOPIA, H. AND A. ADAMS, 1858.

FOR much of the material upon which the following notes are based I am indebted to the Rev. Dr. A. H. Cooke, M.A., F.Z.S., who has collected largely in Transylvania and Western Roumania, the home of *Alopia.*[1] It is everything in work of this kind to have authentic and correctly localized specimens.

Alopia possesses a clausium which is small in comparison to the size of the shell, in spite of the fact that it occupies a position very close to the aperture, so near indeed that both lobes of the spatula are visible externally. The size of a clausium depends on the position and form of the lamella-inferior and lamella-subcolumellaris,[2] but more especially in the presence of the plica-lunata, which runs parallel to the latter along the body-whorl of the shell. When this is present, as in *Alopia, Herilla,* etc., the effect is a reduction in the size of the clausium. When obsolete or nearly so, there is a corresponding widening in the spatula, which is often truncate or broadly-shouldered at the junction with the pedicle. In *Alopia* this junction is *continuous,* that is to say there is not at any point any character which would enable us to fix the limit of either pedicle or spatula.

There is also in *Alopia* the extraordinary fact that certain species do not possess a clausium at all, and examination shews that in these species the internal structure of the shell is either primitive in type or else has undergone considerable modification. In a non-clausiliate species the axis of the columella continues in a straight line as far as the base of the shell. In a clausium-bearing species there is considerable deflection in order to allow of the development of the lamellæ and the formation of the recess into which the clausium passes. In the case of a species in which the clausium is found to be missing, there is always this modification in the columella and in the supporting lamellæ.

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[1] The Distribution and Habits of *Alopia*, by A. H. Cooke; Proc. Malac. Soc., vol. x., p. 90.

[2] Smith and Woodward, op. cit.

The allocation of the non-clausiate species to a separate section is rendered advisable. Adolph Schmidt pointed out that the so-called *Balea* or *Balea-Clausilia* of the Southern Carpathians belonged to *Alopia*, and E. A. Bielz maintained that the group was sub-generically distinct.[1] A new name is, however, needed, because this term is not only cumbersome but it is doubtful whether it can be correctly applied to the section, as here constituted.

NEW SECTION **Ithyption.**

Shell with the external characters of *Alopia*, but distinguished from other *Clausiliæ* by the absence of a clausium, by the absence or modification of the lamellæ and plicæ, and by the relatively straight columella (*ἰθυ*—straight, *πτιων*—flying).

(Sinistral species).

baueri E. A. Bielz.—I have not seen examples of the typical form.

var. **ambigua** Kimakowicz.

a. Donghavás, Transylvania.

b. Czukás, Transylvania.

lactea E. A. Bielz.—I have not seen examples of the typical form.

var. **glorifica** Parr.—Butschetsch, Transylvania.

glauca E. A. Bielz.—Tésla, Transylvania.

binodis Kimakowicz.—Balanbanya, Transylvania.

(Dextral species).

livida Menke.—*a.* Malajester Schlucht, Butschetsch, Transylvania.

b. Mte. Vulkan, Transylvania.

SECTION **Attica** Böttger.

guicciardi Roth.—Clausium nacreous-white; small, solid, spatula not conspicuously bilobed, orifice broad but shallow, pedicle long in proportion, outer lobe not well defined, inner lobe raised, short, slightly produced and deflected. Dodi, Parnassus, Greece. Plate 6, figure 1.

I am at present uncertain as to the true position of this species. The clausium, while exhibiting an affinity with *Alopia*, is not very far removed from *Delima* in the lobe characters, but is separate from both, by the proportionately longer pedicle and its direction in relation to the spatula.

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[1] Cooke, op. cit.

SECTION **Transylvanica** Westerlund.

Clausium nacreous-white; spatula bilobed, broad towards the base, rapidly diminishing in width towards the pedicle, merging into and continuous with the pedicle, concave; outer margin short, solid, and rounded, intercepted near the base by the orifice; inner margin long, continuous, and folded except at the lobe, which is raised, solid, and often spirally produced; pedicle narrow and sinuous, terminating by fusion into the columella at the base of the penultimate whorl, fusion opposite to the aperture of the shell.

plumbea Rossmässler.—Clausium large, spatula deeply excavated, outer lobe short, slightly produced, inner lobe narrow, raised, very solid towards the base, then becoming deflected and extended spirally. Kronstadt, Transylvania. Plate 6, figure 2.

straminicollis Parr.—Clausium very solid, spatula narrowly excavated, outer lobe short, not produced beyond the orifice which is narrow, inner lobe thickened, deflected and spirally produced. Butschetsch, Transylvania. Plate 6, figure 3.

regalis M. Bielz.—Clausium solid, spatula somewhat deeply and squarely excavated, outer lobe very short, only slightly produced, inner lobe extremely solid, raised and thickened and greater in width than in any other species. Lower slopes of N. Piatra Mare, Transylvania. Plate 6, figure 4.

angustata E. A. Bielz.—I have not seen examples of this species.

jickelii Kimakowicz.—I have not seen examples of the typical form.

var. **occidentalis** E. A. Bielz.—Clausium small and extremely fragile, spatula not deeply excavated, outer lobe very short, not produced at the orifice, inner lobe produced but not thickened except at the extreme end, broad, and similar in this width of lobe to *regalis* Bielz. Val Rosea, Petroséiny, Transylvania. Plate 6, figure 5.

deubeli Westerlund.—Clausium fairly solid, rather short, inner and outer margins nearly parallel, outer lobe short, slightly produced, inner lobe solid, raised, spirally deflected, orifice squarely excavated. Behind Bácsfalu, Transylvania. Plate 6, figure 6.

elegans E. A. Bielz.—Clausium similar to *deubeli*, but with a rather longer spatula; orifice very distinctly squarely excavated, deeper cut and more central. Dumbroviciora Schlucht, Roumania. Plate 6, figure 7.

canescens Parr.—Clausium small and solid, spatula narrow, outer lobe short and not produced, inner lobe narrow, convex, solid, very produced and tusk-like. Summit of Piatra Mare, Transylvania. Plate 6, figure 8.

lischkeana Parr.—Clausium dextral, fragile, spatula narrow, outer lobe short, slightly produced, orifice broad, inner lobe narrow, solid, spirally deflected. Propasta Schlucht, Transylvania. Plate 6, figure 9.

fussiana E. A. Bielz.—I give examples from the two forms of the species (which is both dextral and sinistral) which I have examined.

var. **insignis** E. A. Bielz.—Clausium sinistral, solid, spatula narrow, outer lobe short, scarcely produced, orifice broad, inner lobe somewhat narrow, raised, thickened, and spirally produced. Krepatura Schlucht, Transylvania. Plate 6, figure 10.

var. **pruinosa** Charp.—Clausium dextral; otherwise similar in character. Königstein, Transylvania. Plate 6, figure 11.

meschendörferi E. A. Bielz.—Clausium dextral, large, spatula long, very deeply excavated, orifice pyriform, outer lobe broad and produced, inner lobe somewhat narrow, sinuous, thickened and conspicuously produced and deflected spirally. The Zeidnerberg, near Brasso, Transylvania. Plate 6, figure 12.

bielzi Pfeiffer.—Clausium dextral, spatula broad, orifice deep and open, outer lobe short, produced laterally and towards the orifice, inner lobe long, raised, produced, thickened, then becoming narrow and deflected towards the base. Vajda Hunyad, Transylvania. Plate 6, figure 13.

potaissanensis Kimakowicz.—Clausium dextral, spatula broad, orifice deep but narrow, outer lobe short, produced laterally and towards the orifice, inner lobe long, raised, sinuous, spirally produced and deflected, becoming thread-like towards the base. Tordaer Schlucht, Transylvania. Plate 6, figure 14.

madensis Fuss.—Clausium dextral, spatula broad, orifice deep and pyriform, outer lobe much produced towards the orifice and somewhat produced laterally, inner lobe long, raised, sinuous, spirally produced and deflected, becoming thread-like towards the base. Mada, Transylvania. Plate 6, figure 15.

bogatensis E. A. Bielz.—Clausium fairly solid, spatula broad towards the base, deeply and broadly excavated, outer lobe produced laterally and slightly produced towards the orifice, inner lobe thickened, much raised, abruptly deflected and produced. Krizba, Transylvania. Plate 6, figure 16.

RESEARCHES INTO THE HEREDITARY CHARACTERS OF SOME OF OUR BRITISH MOLLUSCA.

PART II.

Helix aspersa Müll. and **H. nemoralis** L.

BY A. W. STELFOX, A.R.I.B.A., M.R.I.A.

(Read before the Society, June 13th, 1917).

UNDER this title I propose to lay before the Society the results of my breeding experiments, from time to time, as may seem desirable. Some of these have now been carried through four generations and their commencement dates back to the years 1909, 1910 or 1911. Until the present most of my experiments have been more or less of a preliminary nature, at first at random, afterwards with the definite object of obtaining pure races of certain well-marked varieties for the purpose of intercrossing. During these preliminaries several interesting facts have come to light, which I think it may be well to place on record, and which I hope will prove of general interest.

In the first case I shall proceed further with my *Helix aspersa* experiment, referring to it and subsequent ones under the numbers used in keeping my records.

EXPERIMENT NO. 25. **Helix aspersa** Müller.

The [1]first part of this experiment has been laid before the Society already, carrying it on to the F2 generation, in which there appeared 72 examples of var. *exalbida* out of a total of 311, the remainder—239—being typically coloured. Two of the young *exalbida* were isolated and reached full growth towards the close of the summer of 1915, but eggs were not laid until the following year, and the first of the F3 generation did not hatch out until the 4th of September, 1916. Two distinct batches of young appeared, no doubt from eggs laid by both parents, numbering in all well over 100 individuals, all of which from the first were at once identifiable as *exalbida*. Further research has tended to prove, therefore, that my former surmise was correct, namely, that the var. *exalbida* is a homozygous recessive form of the species. If this be true, any two *exalbida* will if crossed produce *exalbida* only, *always provided that neither has been already fertilised by a typically brown specimen.*

EXPERIMENT NO. 1. **Helix nemoralis** L.

In March, 1910, four specimens from the precincts of Cross Abbey, near Belmullet, in West Mayo, were placed in a box together. *All* were of a deep yellow colour with translucent bands, a variety for which I now propose the name of *aureozonata* to distinguish it from the paler form known as var. *citrinozonata* of subsequent experiments. All four examples possessed the normal five bands, but in the case of two of these the bands coalesced as follows, 1 (23) (45) and (123) (45). Although fully grown in 1911 no eggs were laid until May, 1912, and the first of the F1 generation did not hatch out before the 6th July of that year. Fifty-three of these were alive in the following December, all of which were distinctly referable to var. *aureozonata*. They proved very difficult to rear, only some seven or eight reaching maturity, the time required for this varying from two to five years. The two furthest developed specimens were isolated in July, 1914, just before reaching maturity, both having the simple band formula of 12345. These laid eggs about the 14th July, 1915, and the F2 generation appeared on the 16th August following. The time between laying and hatching appears to be generally about 28 to 35 days in this species, probably according to temperature, moisture and other factors of environment. The young F2 were at once noticed to be of a clear deep golden-yellow colour and soon proved to be all *aureozonata*. It may be well to remark here that all *Helix nemoralis* are born bandless and most of them are yellow, though the shade of this colour varies from pearl-white to golden-yellow, as in the present instance. Prof. Lang [1]records having observed reddish tinted newly hatched *Helix nemoralis* and *H. hortensis* hybrids and I think that such have also come under my notice, although the red colour of most does not become apparent until the growth has considerably advanced.

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[1] A cross between typical *Helix aspersa* and var. *exalbida*, *Journ. of Conch.*, vol. xiv., pp. 293—295, 1915.

It may be well to add what I know of the banding of F1 and F2 generations. Of the twelve examples of F1 which reached an age sufficient to show the mature banding, seven were 12345 and five were 10345. The bands of a few of the former might possibly have coalesced had they been grown to maturity. The latter having the second band missing differ from any of the originals. Only one specimen of F2 still survives and it is still too young for the banding to be seen; but it will, I think, prove to be 12345.

From the above results it appears that the parents of the F1 generation were of a pure strain and from this and other experiments I am inclined to regard the forms of *H. nemoralis* with translucent bands as homozygous and recessive, at least so far as the translucent band character is concerned. It has been suggested to me by Mr. Watson that the results of Prof. Lang's experiments would lead one to believe that the less banding, or the nearer a specimen came to being bandless, the more dominant such would prove to be. In the above experiment the appearance of shells with the second band absent, bred from five-banded parents, is distinct evidence against such a universal supposition.

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[1] "Über die Bastarde von *Helix hortensis* Müller und *Helix nemoralis* L.," by Prof. Arnold Lang, Jena, 1908. Versuch xl., Pr. No. 471 (289).

EXPERIMENT No. 2. **Helix nemoralis** L.

Commenced in April, 1910, with two specimens collected in a wood near Kiltoom, Co. Roscommon. Both specimens were of a pale pinkish red colour, which for the want of a better name I shall call *carnea*; one specimen possessed a band formula 12345, all the bands being much interrupted and almost reduced to spots (a very common feature in specimens found in the central districts of Ireland); in the second specimen the third band was well developed and there were distinct traces of the fourth and fifth; all three bands showed a tendency to be spotted. We may refer to both the originals, therefore, as *carnea-interrupta*.

The F1 generation was born in June, 1912; many died, but 37 reached an age sufficient to leave no doubt as to their colouring and banding. Of these eleven were *libellula* and twenty-six *carnea*; one (*libellula*) was bandless; ten had five bands (five *libellula* and five *carnea*); twenty-six had three bands, 00345 (five *libellula* and twenty-one *carnea*). In the case of three only (all *carnea*) were the bands continuous, the remaining thirty-three banded shells all possessing the interrupted bands. The experiment ends here, owing to some disease attacking and destroying the whole F1 generation before any reached maturity.

The chief facts of interest are, firstly, the appearance of *libellula* shells from *carnea* parents, pointing to the supposition that yellow is recessive to red. Secondly, the appearance of a bandless shell from two banded parents. As stated in the last experiment, Prof. Lang's researches led him to conclude that bandlessness was dominant to bandedness, and in most cases this would seem to be true. I would like to put forward the suggestion here, however, that besides the dominant bandless state there may be also a recessive one, both being similar in outward appearance. The latter might be due to the absence of the factor necessary to produce the banding, the former to the presence of an inhibiting factor preventing the bands' appearance, even though the factor to produce bands were present and these might become apparent in the succeeding generation.

The fact that all *H. nemoralis* are hatched from the egg in a bandless state might be taken to signify that this was the primitive type of the species, according to the law of recapitulation. It may be opportune to mention here the order in which, according to my observations, the different bands appear in the young shells. The third band comes first, almost contemporaneously with the commencement of growth after the young snail is hatched from the egg. The fourth and fifth respectively appear next, followed sometimes at a considerable interval by the second and lastly the first. The fourth and fifth and the second and first sometimes come almost simultaneously (or perhaps their order of coming may even be reversed, although I have not seen this occur). It will be seen, therefore, that the form 00345, for instance, may quite possibly be a 12345 with the commencement of bands 1 and 2 abnormally retarded; or on the other hand it may be due to the presence of an inhibiting factor which does not act on the three lower bands; or finally it may be due to the absence of the factor or factors which would, if present, produce the bands.

EXPERIMENT No. 3. **Helix nemoralis** L.

The originals in this experiment consisted of eight *libellula*, one of them 12345, two 1(23)45, two 1(23)(45) and three (123)(45), from the Co. Fermanagh hills north of Kiltyclogher, collected in July, 1909. A large proportion of the shells observed in this locality were similar or belonged to the var. *roseozonata*, and the majority were very conical in shape.

Two families of the F1 generation were hatched, the first in September, 1909, the second in June, 1910. All the young shells were banded and those grown to maturity most strikingly resembled the originals in their colouring, banding and conical shape. The F1 never laid eggs and the last died in April, 1916.

EXPERIMENT No. 4. **Helix nemoralis** L.

Eleven or twelve var. *roseozonata*, from the same locality near Kiltyclogher as the originals of the last experiment, were placed in a box in July, 1909. Young appeared in the following September. To my great surprise none of F1 which survived to an age sufficient for the determination of their characters were *roseozonata*. On the other hand all possessed a reddish ground colour and five normally pigmented bands, some of which in cases coalesced. Under similar circumstances I am afraid that Prof. Lang would have been tempted to explain this result by some elaboration of Mendel's law, but it can more easily be accounted for, I think, by supposing that the parent or parents of F1 had been fertilized by one of the many shells similar to those belonging to the last experiment, which were abundant in the locality from which both came. Provided that the parents were fertilized previous to my collecting them, and that opaque or black banding is dominant to translucent banding and red is dominant to yellow, the F1 generation of such a cross would naturally be red opaquely banded shells. A certain percentage of *roseozonata* woul almost certainly have appeared in F2, but at that time I had no arrived at the above explanation of the affair and gave up the experiment.

It may be interesting to note that at the conclusion of the experiment in June, 1912, six of F1 were alive, all born on the same day in September, 1909, and yet they varied greatly in degree of apparent maturity. Whereas two of them were fully grown perfect specimens, one was but half-grown, two about a third full size, and the sixth was scarcely bigger than when it emerged from the egg two years and nine months earlier although feeding regularly and apparently quite healthy until the day the experiment closed. I notice in most of my experiments that such variation in the rate of growth is common. Some shells start growth at once and complete their shell in from fourteen to sixteen months, while others take several years to reach maturity. Yet both the slow and the quick growers seem healthy. One is almost tempted to suggest that this diversity might be a provision of nature to prevent all examples of one year's hatching from arriving at perfection in the same breeding season, thus tending to prevent in-breeding. It may be, however, that it is only under artificial conditions that the slow growing specimens would ever attain full growth.

EXPERIMENT No. 5. **Helix nemoralis** L.

Two of the *roseozonata* from Co. Fermanagh used in the last experiment were isolated in March, 1910. One had five bands, 12345, while the other possessed three, 00345. Eggs were laid by one of the snails on the 20th May, 1910, and these hatched out on the 21st—23rd June following. The first of the young to reach maturity did so when exactly two years old. Nine specimens of F1 survived until their characteristics were revealed; all were red in colour and all but one were banded. Four were *roseozonata*; while four had opaque typical bands; one of the former was 00345 and three were 12345; of the latter two were 00345 and two 12345. Only six completed the lip and of these three *roseozonata* and one bandless *rubella* had the white lip of the mother shell. The two opaquely banded shells had normal dark lips. Such a mixed F1 generation is perhaps best explained, as in the last experiment, by the supposition that the mother shell had been fertilized by an opaquely banded example before the former was collected; but in this case by a heterozygous example, thus permitting a percentage of *roseozonata* to appear in F1.

Two families were reared in the F2 generation: "A" from two *roseozonata*, 12345 and 00345 respectively; "B" from the *rubella*-

albolabiata and the *rubella*, 00345. I will deal with the "A" family first.

One of the chosen examples attained full growth in July, 1912, the other not until May, 1913, while the F2 generation hatched out on the 11th September of the latter year. Eight of these reached an age sufficient to show that they were all *roseozonata*, but only one is still alive and it, even in June, 1917, is not large enough to show its mature band formula. Had it been possible to carry this family forward to another generation I have little doubt that a pure breed of *roseozonata* would have been established.

To turn now to the family "B," both the selected parents were fully grown in July, 1912, but no eggs were laid until the following year and F2 did not arrive until the 1st July, 1913. It is most unfortunate that great mortality occurred in this family also and none survived to attain perfection. The ground colour and banding of some twenty-four can, however, be listed without possibility of error as follows. Seven were bandless and yellow, *libellula* 00000, the rest had red shells and in this resembled the parents; two of these reds had opaque black bands, five were *roseozonata* and ten were bandless; of the two with opaque bands one was 12345 and the other 00305; of the five *roseozonata*, two were 12345, two 00305 and one was 00345. Ignoring the colour variation and dealing only with the bands and their absence, seventeen were bandless, three were 12345, three 00305 and one was 00345. The idea that bandlessness is a dominant characteristic is here shown to be well founded, but sufficient specimens were not procured to be able to state that the results were a "brilliant confirmation" of Mendel's law.

GENERAL REMARKS.

It is perhaps necessary to give a few general particulars relating to my experiments. In the first place the animals are kept in boxes 8 × 6 × 5 inches deep, with a removable tight fitting glass cover, no special means of ventilation being provided. Over-dampness is, therefore, the chief thing to be guarded against and is probably the cause of a good many deaths. On the other hand it permits of my being away from home even up to a period of three weeks without greatly interrupting the feeding and shell-making of the mollusks during the period of growth; the sand at the bottom of the box keeps the air in the box sufficiently moist to promote activity. For tood, slices of carrot and lettuce leaves have been maintained as the principal supply, with turnips, parsnips, and cabbage in case of emergency. Once a week this food is changed and the interior of the boxes ed lightly with water during the summer months; in winter no red and the boxes are kept as dry as is considered advisable. I have now discovered by somewhat painful experience tha the success or failure of rearing a batch of newly hatched shells depends upon being at hand on the day of their hatching and being able to give them a slight shower-bath and some fresh food. With a good start all will probably go well, but once let the youngsters seal themselves on to the side of the box or glass and it is almost impossible to get them to feed. The nature of the sand kept in the bottom of the box is another matter for care. At great trouble to himself my friend Mr. Robert J. Welch brought me some pounds' weight of sand from Rosapenna in Co. Donegal, which being highly calcareous we thought would help greatly. Mortality soon increased and the shells were subject to much malformation, but it was not until nearly two years later that I traced the cause to the sand. The supply having run out, some local Co. Down siliceous sand was used, lime being provided by a lump of old mortar, and the health and shell-forming activity quickly improved. I believe the injuries were caused by the presence in the Rosapenna sand of multitudes of sponge spicules as well as the broken spines from the tests of sea urchins. Not only did these spines injure the mantle and consequently the making of shell, but I believe that they actually caused the death of many individuals by becoming embedded in the walls of the intestines. It is necessary, perhaps, to state what has often been pointed out before, that the sand is actually eaten by the snails, the chief purpose being, of course, to obtain lime. This brings me to a statement of long standing often copied by modern writers, I fancy without personal verification, namely, that the young snails bury the mouth of their shells in the sand while the shell is being added to. All my experiences point to the conclusion that they do this to obtain lime *before making shell* but that the shell is added to when they are on the glass or on the sides of the box, in other words when there is no chance of anything touching and injuring the newly formed shell. The following data relating to the rate of growth of the shell may be interesting. They refer to notes on the growth of one of the *roseozonata* in Experiment No. 5, which was selected as a parent for the F2 "B" generation:—"The 00345 specimen came out of hibernation on 28th February, 1913; on 5th March it had added an eighth of an inch of new shell and by each of the following dates a further eighth of an inch had been completed, 12th, 21st, and 30th March, 7th and 16th April." On the last date the lip was commenced and this was perfectly completed on the 25th of May, as nearly as could be ascertained. During this time so far as I was aware the animal never buried itself in the sand and when not feeding remained quiescent and attached to the side of the box. One more point of interest may be touched on briefly. The colour of some of the newly hatched *H. nemoralis* has been referred to above, but nothing was mentioned regarding their size. Now the size of the egg may vary considerably and that of the newly hatched shell as much as a quarter of a whorl or as much as a millimetre in diameter. The smallest I have reared are the young of the *aureozonata* from Co. Mayo of Experiment No. 1, which are identical in size with the normal young of *H. hortensis* which, of course, they also resemble in size and shape and general outward appearance when mature. Their darts, however, are quite typical of *H. nemoralis* except that they are rather smaller than usual.

Since the publication of my former article, I have to thank Mr. Hugh Watson, of Cambridge, for much kindly interest, as well as for encouragement and a great deal of useful information regarding Prof. Lang's more extended reseaches and modern advances in Mendelism.

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Discovery of Limax tenellus in the New Forest.—Mr. G. B. C. Leman, son of my old friend and correspondent Mr. G. C. Leman, has been spending a holiday beetle-hunting in the New Forest and sent me some slugs. I at once suggested to him the possibility of the occurrence of *L. tenellus*—which had never been recorded for vice-county 11, Hants. S.—indicating likely places to search. He and his father and sister spent three days in close investigation of the primæval beech woods, with the result that he sent me on the 12th September one of the finest lots of this species that I have ever seen. Some I at once sent for permanent preservation in the British Museum. They were found on red fungi among beech and holly leaves, more particularly the latter, under the beech trees. I sent one of the fungi to my friend Mr. W. Norwood Cheesman, F.L.S., of Selby, who kindly informs me that it is *Gomphidius viscidus*, a remarkably impermanent species—which will appear in great abundance in particular years and then not be seen again for several seasons in succession—the mycelium only availing itself of suitable circumstances as to moisture, etc., to send up the visible portion of the fungus. Mr. Leman sent also *Arion minimus* and var. *grisea*, *A. subfuscus* var. *rufofusca*, var. *cinereofusca*, and var. *fuliginea*, *A. ater* var. *castanea*, var. *luteo-pallescens*, and var. *plumbeo-pallescens*, *A. hortensis*, *A. circumscriptus*, *Agriolimax agrestis* var. *reticulata*, and one young *Limax cinereoniger* var. *efasciata*. This discovery completes the full tale of British slugs authenticated for vice-county 11, Hants. South, the impossible *Geomalacus maculosus* being the only one not found.—W. DENISON ROEBUCK (*Read before the Society*, October 13th, 1917).

Paludestrina jenkinsi Smith in Bucks.—This almost ubiquitous species is now found in the Misbourne river at Denham, Bucks. Also in another stream one mile south-west of Denham. The shells are all var. *ecarinata* Jenkins. Nine years ago I noticed a colony by the Frayswater at Uxbridge, Middlesex, about 1½ miles from the above localities, but until this May I had not taken the species in Bucks. All the three streams mentioned belong to the Colne system.—J. E. COOPER (*Read before the Society*, June 13th, 1917).

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CENSUS AUTHENTICATIONS.

By W. DENISON ROEBUCK, M.Sc., F.L.S., Hon. Recorder.

All the records here given are based upon examples submitted to the official authenticators: myself for slugs only; Mr. F. Taylor for *Paludestrinidæ*; and Mr. J. W. Taylor for all other species. C.S.V.C. = Conchological Society's Voucher Collection.

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2 **Cornwall East.**—Mr. J. H. Adams has sent a couple of adult and one juvenile *Pupa anglica*, very small, found in a boggy bit of wood about three-quarters of a mile from Polbathick, just where the road from Hessenford joins the main road between Liskeard and Plymouth. This record is of interest because the first from the mainland of the west and south of England, previous records being for the Channel Islands and Lundy Island. He has also submitted an immature example of *Hygromia fusca* found in a hedge near Wringworthy by Looe in 1916.

3 **Devon South.**—*Testacella maugei*, Totnes, 20th September, 1917 (E. D. Marquand).

4 **Devon North (mainland).**—*Hygromia revelata*, cliffs west of Ilfracombe (C. P. Hurst, 27th June, 1917).

6 **Somerset North.**—*Hyalinia lucida*, Weston-super-Mare, one (J. D. Dean, 22nd Feb., 1917; *Sphyradium edentulum*, Weston-super-Mare, one, May, 1914 (idem).

7 **Wiltshire North.**—*Sphyradium edentulum*, one, Savernake Forest (Cecil P. Hurst, 30th Nov., 1917). *Hyalinia pura*, Roundway Down, 10th Oct., 1917, two, var. *margaritacea*; *Limnæa stagnalis* and *Planorbis corneus*, Kennet and Avon Canal, Devizes, 9th Oct., 1917; *Limax cinereo-niger*, Savernake Forest, 2nd Sept., 1917, numerous, including vars. *cinereo-nebulosa*, *maura*, *efasciata*, *strobeli*, *luctuosa*, *vera*, *vera + brunnea* and *interrupta + brunnea*; *Arion intermedius*, Savernake Forest, 11th Oct., 1917, a few (C. Oldham).

8 **Wiltshire South.**—*Helicella heripensis*, three, *Ena montana*, one, Erlestoke, 11th October, 1917; *Limax flavus*, one, var. *antiquorum*, Devizes town, 1[illegible]th October, 1917; *Vallonia costata*, south bank of Kennet and Avon Canal, Devizes, one, 9th Oct., 1917 (C. Oldham). Mr. C. P. Hurst has presented to the Voucher-Collection the following:—*Helicella cantiana*, numerous specimens all of var. *albocincta*, including a few with tendency towards the colouring of var. *rubescens*, from road-side near Shalbourne; *Clausilia rolphii*, abundant on hedge-bank near Stype Wood, Bagshot; and *Ancylus fluviatilis* abundant in stream near (and south of) Great Bedwyn; all taken in early June, 1915.

10 **Isle of Wight.**—*Agriolimax lævis*, common near Sandown, 20th August, 1917 (Rev. S. Spencer Pearce).

11 **Hants South.**—*Limax tenellus*, New Forest, 12th Sept., 1917 (G. B. C. Leman). *Vallonia costata + excentrica*, Hambledon; *Ena montana*, Ditcham Wood; *Testacella haliotidea*, Hambledon; *T. scutulum* and *T. maugei*, Drover's Nursery, Fareham (L. Dawes).

14 **Sussex East.**—*Arion ater* var. *nigrescens*, West Hoathley, 5th May, 1917. This completes the Census of *A. ater* in Great Britain, and only two Irish Vice-Counties are now required, viz., Longford and Cork N.W. *Limax cinereo-niger* var. *vera* (in markings, colour dark brown), Forest Row, 17th May, 1917; *Agriolimax lævis*, Forest Row, one, 23rd May, 1917 (Lieut. C. T. Cribb).

iddlesex.—*Physa acuta*, river Brent, near Hendon, July, 1917, first time in "natural" habitat (J. E. Cooper).

xfordshire—*Anodonta anatina*, two, and a few *Fisidium supinum*, Oxford nal near Bletchington Station ; *Agriolimax lævis*, one, and numerous *Opeas dalli*, Headington Hill gardens, 26th Sept., 1917 ; *Paludestrina jenkinsi*, idlington, 1st Oct., 1917, numerous ; *Milax sowerbyi*, cottage garden in East xford, 9th Aug., 1917, one juvenile ; *Sphærium lacustre* and *Pisidium sub- uncatum*, a few each, old brick-yard, Headington Quarries, 12th Aug., 1917 . Dawes).

ucks.—*Paludestrina jenkinsi*, Denham, numerous (J. E. Cooper, June, 1917) ; *hærium pallidum*, brook, outlet from Grand Junction Canal at Marsworth, e valve, 28th May, 1917 (C. Oldham).

edfordshire.—*Helicella heripensis*, one, Studham, 4th Nov., 1917 (C. Oldham).

erefordshire.—*Helicella heripensis*, West Malvern (J. R. le B. Tomlin, 9th ly, 1917 ; C.S.V.C.).

Vorcestershire.—*Sphærium pallidum*, canal lock, Stourport, one, 15th Oct., 917 (C. Oldham).

hropshire.—*Limax arborum*, type, Haughmond Abbey Woods, 14th Oct., 917, one (W. T. Elliott).

lamorganshire.—Mr. D. Bacchus has submitted a half-grown *Milax gagates* ar. *rava*, found 2nd Oct., 1916, under a stone on a sandy bank within twenty ards of the beach at Sully. *Zonitoides excavatus*, Glyn Neath, one, var. *itrina* (H. M. Hallett and J. D. Dean, 22nd Feb., 1917). *Helicella heripensis*, ully, 20th Sept., 1917 (J. D. Dean).

Wigtownshire.—Mr. A. Ross, of Glasgow, has presented to the Voucher-Collection a few *Succinea elegans* taken in Physgill Burn near St. Ninian's Cave, nd two exceedingly thin-shelled immature but nearly grown *Helicigona arbus- orum* var. *pallida* from the Isle of Whithorn, 17th July, 1916 ; also three *Pupa nglica* from a road plantation between Isle of Whithorn and Port William, st August, 1916. A new worker, Mr. J. G. Gordon, of Corsemalzie, near Vhauphill, has submitted a series of twenty-one species, which he collected the years 1909 to 1911, including five new county records as follows: *imnæa palustris*, several much eroded examples of m. *decollatum* from Loch ennows ; several *Planorbis albus* and a few *Pl. contortus* from Loch Chesney ; number of *Sphærium corneum* from both these lochs, and also from the Malzie urn at Corsemalzie ; and a few eroded examples of *Bithynia tentaculata* from e burn last named and from Loch Elrig ; also *Limax arborum*, type, taken st Sept., 1916, in a wood near Corsemalzie.

tirlingshire.—*Planorbis fontanus*, Falkirk, 11th Oct., 1917 (G. Nelson).

incardineshire.—*Helix nemoralis*, St. Cyrus, a few var. *libellula* 12345 and wo 10345 (Rev. G. A. F. Knight). This record is interesting as further efining the northern limit of the species in Britain.

berdeenshire South.—*Limax cinereo-niger* vars. *luctuosa* and *maura*, angle Glen, Aboyne, 28th June, 1917 (Miss J. Gowan).

anffshire.—*Hygromia fusca*, one, *Zonitoides nitidus*, three, 21st July, 1917, ochieneal near Cullen ; *Succinea putris* at Cullen, numerous, close to sea, 5th May, 1917 ; *Planorbis crista* var. *lævigata* and *Pisidium milium*, pond in ullen House grounds, 24th Aug., 1917 ; *P. pulchellum*, *Vallonia pulchella*, nd *Vertigo pygmæa*, Sandend Links, Fordyce, 27th Aug., 1917 ; *Planorbis lbus*, numerous, *P. contortus*, a few, Cullen House grounds, Rathven, 13th

June, 1917; *Pisidium subtruncatum*, various places in Cullen and Rathven parishes, 18th June, 1917; *Vertigo substriata*, Cullen Links, 13th Sept., 1917; *Agriolimax lævis*, Cullen, 29th April, 1917; *Pisidium pusillum*, ditch at foot of Bin, Rathven, a few, 28th July, 1917; *Pupa anglica*, Sunnyside Cliffs, Fordyce, 30th July, 1917, several; *Hygromia granulata*, near Boyne Castle, Boyndie, 6th Aug., 1917, several; *Succinea elegans*, three on banks of Glassaugh Burn, Fordyce, 3rd August, 1917; *Acanthinula lamellata*, several amongst beech leaves at foot of Bin, Rathven, 4th Aug., 1917 (Miss J. Gowan).

96 **Easterness.**—*Limax maximus*, Inverness, one, var. *punctata* (sent to British Museum for preservation), 1st Oct., 1917; *Punctum pygmæum* and *Carychium minimum*, Mill Burn, Inverness, 5th Oct., 1917; *Helicella caperata*, Culduthill Road, Inverness, 8th Oct., 1917 (Miss J. Gowan).

98 **Main Argyll.**—Mr. William Rennie has submitted a number of slugs, collected at Kirk, on the 4th Jan., 1917, close to high-water mark, including a very minute but quite characteristic example of *Milax sowerbyi*. This is of interest as being so far the most northerly extension of its range along the western side of Scotland.

99 **Dumbartonshire.**—*Sphærium corneum*, *Pisidium subtruncatum*, *Valvata piscinalis*, *Planorbis contortus*, *Arion subfuscus*, and *Agriolimax lævis*, all in or near Clober Dam, Milngavie, 14th July, 1917; *Pisidium nitidum*, Milngavie, one, 9th June, 1917 (Wm. Rennie). *Hygromia fusca*, one, Peaton, 21st Sept., 1917 (W. Evans).

101 **Cantire.**—*Limax cinereo-niger* var. *efasciata*, west side of West Loch Tarbert, 24th July, 1917 (Alex. Ross).

102 **Ebudes South.**—Mr. J. F. Musham paid two visits to Colonsay and Islay in 1913, and collected numerous species. He found a few *Arion hortensis* on Colonsay, 3rd July, 1913, rather small; *A. intermedius* and its var. *grisea* at Port Ellen, Islay, 27th July, 1913; *Zua lubrica* at Port Ellen, two, 28th July, 1913; *Hyalinia radiatula*, *Hygromia granulata*, *Sphyradium edentulum*, *Planorbis spirorbis* var. *rotundata*, all on Colonsay, July, 1913; *Hygromia hispida*, a few of the red-brown variety, and one *Hyalinia nitidula*, *H. fulva*, one example of var. *mortoni*, *Helicella itala* and var. *leucozona*, all at Port Ellen, 28th July, 1913.

103 **Ebudes Mid.**—*Helicigona arbustorum*, type, Iona, several (G. A. F. Knight).

106 **Ross East.**—*Helicella caperata*, Invergordon, Oct., 1913 (K. H. Jones); C.S.V.C.

110 **Hebrides.**—The Rev. G. A. F. Knight has sent *Helix nemoralis* var. *libellula* (12)3(45) merging into (123)(45) at mouth, one adult from North Uist. He also submitted a small dead and bleached shell from Benbecula, apparently referable to *H. hortensis* 12345. It may be stated that the Hon. Recorder and Referee would be glad to have *living* examples of these forms from the Outer Hebrides and Western Islands of Scotland, with the view of determining from the character of the dart whether both species inhabit this and other vice-counties.

124 **Dublin Co.**—*Physa acuta*, Dublin, one (L. Dawes, 29th August, 1917).

146 **Cork N.E.**—*Vallonia excentrica*, Moore Park, near Fermoy, 5th May, 1917 (Signaller E. Stainton, 2/6th Batt. Scottish Rifles).

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PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

ANNUAL REPORT OF THE LONDON BRANCH.

SINCE our last report nine meetings of this branch have been held. The attendance has been satisfactory considering the many calls upon members' time.

The exhibits were quite up to the average of past years, and included fine sets of *Obba*, *Acavus*, and *Thersites*.

Mr. A. S. Kennard has contributed a very interesting series of notes on various British non-marine shells, with special reference to fossil forms.

It was not found possible to have the usual field-meetings this summer.

Once more we have to thank Mr. J. C. Dacie for kindly allowing us to use his office for the evening meetings.

J. E. COOPER, *Hon. Sec.*

THE NORTH STAFFORDSHIRE BRANCH.

OWING to the absence of the Hon. Secretary on active service, it has been impossible to arrange any meetings during the past year.

466th Meeting, held at the Manchester Museum, November 14th, 1917.

Mr. B. R. Lucas in the chair.

Donations to the Library announced and thanks voted:

From Messrs. W. B. Marshall, W. H. Dall, Paul Bartsch, and Madame Henri Fischer. Also Part 23 of J. W. Taylor's "Monograph of the Land and Freshwater Mollusca of the British Isles" (purchased).

New Members Elected.

J. H. Adams.
W. H. Whitelock.

Candidates Proposed for Membership.

L. Bryan Langmead, Uplands, Honor Oak Road, Forest Hill, London, S.E. 23 (introduced by W. Denison Roebuck and J. W. Taylor).

John Morley, A.M.J.Inst.E., Clarence Lodge, Ashburton Road, Trafford Park, Manchester (introduced by J. W. Jackson and W. H. Davies).

Exhibits.

By Mr. W. H. Davies: *Neritina fluviatilis* from the canal at Lancaster.

By Mr. G. C. Spence: Embryonic *Clausilia biplicata* from shells collected at Mortlake.

By Mrs. Gill: Series of *Hemicardium* and *Isocardia.*

By Mr. J. Ray Hardy: Large *Planorbis corneus* (35 × 30 mm.), collected many years ago in the now filled up Cottage Pits, Chorlton; *Planorbis corneus* (white variety) from pit at Birch, Lancashire; and large *Planorbis umbilicatus* (18 × 15 mm.), from Mere Mere, Cheshire.

By the Manchester Museum: A selection of the smaller species of shells from São Thomé (ex Shackleford Collection).

In the Special Exhibit of *Chloritis*, series were shown by Messrs. R. Standen, G. C. Spence, Mrs. Gill, and the Manchester Museum.

It was decided to have the following Special Exhibits:

January 9th - Genus *Turricula* of *Mitridæ*.
February 13th - *Natica*.
March 13th - *Arca*.

467th Meeting, held at the Manchester Museum, December 12th, 1[illegible]7

Mr. B. R. Lucas in the chair.

Donations to the Library announced and thanks voted:

From Messrs. J. C. Melvill, Hans Schlesch, E. W. Bowell, and the March[illegible]se di Monterosato.

New Members Elected.

L. Bryan Langmead.
John Morley.

Members Deceased.

Rev. F. H. Wood.
Ernest Pattison.

Exhibits.

By Mr. W. H. Davies: A subscalariform specimen of *Hygromia striolata* fro[illegible] Ansdell, Lancs.

By Mr. G. C. Spence: *Riebeckia socotrana* from Socotra; and *Berendt*[illegible] *taylori* from Lower California.

In the special exhibit of *Camæna*, interesting series were shown by Messr[illegible] E. Collier, R. Standen, G. C. Spence, Mrs. Gill, and the Manchester Museum.

468th Meeting, held at the Manchester Museum, January 9th, 1918.

Mr. B. R. Lucas in the chair.

Donations to the Library announced and thanks voted:

From Messrs. J. R. le B. Tomlin, A. S. Kennard, B. B. Woodward, and H[illegible] Schlesch. Also Part 95 of the "Manual of Conchology," presented by Dr. H. A[illegible] Pilsbry.

Donations to the Cabinet announced and thanks voted:

The types and figured specimens of the *Pisidia* dealt with in the paper o[illegible] "The Pisidium Fauna of the Grand Junction Canal in Herts. and Bucks., etc.," presented by the author of the paper, A. W. Stelfox.

Candidates Proposed for Membership.

William Ernest Alkins, Stoneydale, Oakamoor, Stoke-on-Trent (introduced b[illegible] J. W. Jackson and R. Standen).

Geo. A. Stephen, F.L.A., City Librarian, the Public Library, Norwic[illegible] (introduced by J. W. Jackson and G. C. Spence).

Resignation.

E. W. Presbrey.

Paper Read.

"The Pisidium Fauna of the Grand Junction Canal in Herts. and Bucks., wit[illegible] an appendix on the species of the genus that occur in the districts bordering th[illegible] canal, but which have not so far been found living in it," by A. W. Stelfox, M.R.I.A.

Exhibits.

By Mr. G. C. Spence: Species of *Holospira* from Mexico.

By Mrs. Gill: Several species of *Delphinula*.

By Mr. W. H. Davies: *Planorbis dilatatus* from the Bolton Canal at Agecro[illegible] and Clifton Junction, near Manchester; also other local shells.

By Mr. A. W. Stelfox: A large series of *Pisidium* from the Grand Junction Canal in Herts. and Bucks. to illustrate his paper.

In the special exhibit of *Turricula* (*Mitridæ*), series were shown by Messrs. J. C. Melvill, J. R. Hardy, C. H. Moore, Mrs. Gill, and the Manchester Museum.

TREASURER'S REPORT.

Accounts for the Year ended December 31st, 1917.

Income and Expenditure Account.

INCOME.		£ s. d.
To Annual Subscriptions—		
For 1917, 190 at 5/0	47 10 0	
Arrears, 236 at 5/0	59 0 0	
		106 10 0
,, Donations towards cost of Illustrations		3 10 0
,, Sale of Publications ...		2 8 0
,, Advertisements		2 3 6
		£114 11 6

EXPENDITURE.		£ s. d.
By Deficit at Jan. 1, 1917		24 10 2
,, Publishing and Distributing *Journal of Conchology*—		
Vol. xv., no. 4,	12 10 8	
,, ,, ,, 5,	13 0 3	
,, ,, ,, 6,	15 4 7	
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,, Authors' Reprints ...		8 16 0
,, *Monograph of Land and Freshwater Mollusca*, parts xxi.—xxiii. ...		0 15 9
,, Fire Insurance		0 10 0
,, Subscriptions—		
Lancashire and Cheshire Fauna Comm.,	5 0	
Scientific Year Book ...	6 6	
Malac. Soc. ...	10 6	
		1 2 0
,, Printing and Stationery		5 5 8
,, Officers' Expenses—		
Secretary and Librarian,	5 13 7	
Treasurer,	2 19 1	
Recorder,	1 1 1	
Editor,	1 11 0	
		11 4 9
Balance, being excess of Income over Expenditure		6 10 11
		£114 11 6

Life Membership Fund.

	£ s. d.		£ s. d.
To Six Composition Fees at £3 3 0	18 18 0	By amount of Fund at Dec. 1, 1917	18 18 0

Balance Sheet.

LIABILITIES.	£	s.	d.	ASSETS.	£	s.	d.
Annual Subscriptions paid in advance— 1918, 13 at 5/0, 3 5 0 1919, 1 at 5/0, 5 0	3	10	0	Annual Subscriptions for 1917, outstanding, 52 at 5/0, £13, estimated to produce	7	16	0
Life Membership Fund ...	18	18	0	5% National War Bonds ...	15	0	0
Balance of Income and Expenditure Account ...	6	10	11	Cash at Bankers	13	18	11
Balance, being excess of Assets over Liabilities ...	7	16	0				
	£36	14	11		£36	[illegible]4	11

NOTE.—Assets in addition to those set out in the Balance Sheet are:—(*a*), Library; (*b*), Cabinets and Collections; (*c*), Stock of U[illegible]sold Publications; (*d*), Annual Subscriptions in arrear prior to Jan[illegible] 1st, 1917.

Audited and found correct,
FRED TAYLOR,
C. HERBERT MOORE.

Jan. 5, 1918.

469th Meeting, held at the Manchester Museum, February 13th, [illegible]918.

Mr. R. Standen in the chair.

Donations to the Library announced and thanks voted:

From Messrs. A. W. Stelfox, S. S. Berry, and C. M. Steenberg. Also "[illegible]ear-Book of Scientific and Learned Societies, 1917" (purchased).

New Members Elected.

W. E. Alkins.
G. A. Stephen.

Member Deceased.

J. W. Roberts (*killed in France*).

Mr. R. Bullen Newton's Jubilee of Government Service.

On behalf of the Conchological Society, the Hon. Secretary wrote to M[illegible]. R. Bullen Newton congratulating him on the completion of fifty years of State Se[illegible]vice, and the following letter was received in reply:

LONDON, 13/1/18.

DEAR MR. JACKSON,

Please accept my best thanks for conveying the congratulations of the Conchological Society on my Jubilee of Government Service. Coming from a Society of which I have had so long a membership enhances the value of such a message and I can only say that I deeply appreciate so kindly a recognition.

Yours very faithfully,
R. BULLEN NEWTON.

Paper Read.

"On the *Pisidium nitidum* and *P. pusillum* of Jenyns: A reply," by [illegible] B. Woodward, F.L.S., etc.

NOTES ON WILTSHIRE MOLLUSCA.

By C. P. HURST.

(Read before the Society, June 9th, 1915).

THE following shells were collected within a five-mile radius of Great Bedwyn, which is near the middle of the eastern border of Wiltshire, not very far from the Wiltshire-Berkshire boundary. The Kennet and Avon Canal passes through Great Bedwyn, which is therefore placed partly in vice-county 7 (North Wilts.) and partly in vice-county 8 (South Wilts). I have used the new county boundaries.

Helicella cantiana Montagu.

Var. *albocincta* Cockerell.

Near Shalbourne, v.c. 8; rather plentiful along the road-side; many immature shells.

Hygromia striolata Pf.

Monstr. *scalariforme* (*teste* E. W. Swanton).

Hedge-bank near Stype Wood, Bagshot, v.c. 8.

Helicigona arbustorum Linné.

Var. *fuscescens* Duchassaing.

Hedge-bank near Stype Wood, Bagshot, v.c. 8.

Var. *flavescens* Moq.

Hedge-bank near Stype Wood, Bagshot, v.c. 8.

Helix hortensis Müller.

Var. *incarnata* Moq.

A few specimens so named by Mr. E. W. Swanton were found by the road-side near Great Bedwyn, v.c. 8. They possessed the beautiful violaceous-brown peristome of sub-var. *sauveuri* with a paler rib.

Var. *olivacea* Taylor.

A specimen so named by Mr. E. W. Swanton was found in a garden at Great Bedwyn, v.c. 7.

Ena montana Draparnaud.

In three woods near Ham; one of the woods is wholly in Berkshire, the second is partly in Berkshire and partly in Wiltshire, v.c. 8, the third is entirely in Wiltshire, v.c. 8.

Ena obscura Müller.

Var. *albina* Moq.

Twenty-four specimens of this rare colourless variety were found by the road-side near Great Bedwyn, v.c. 8.

Azeca tridens Pulteney.

A good many specimens were found in hedge-banks near Stype Wood, Bagshot, v.c. 8.

Var. *crystallina* Dupuy.

A single specimen was discovered in a hedge-bank near Stype Wood, Bagshot, v.c. 8.

Clausilia rolphii Leach.

Eighty-one specimens of this rare species were found in a hedge-bank near Stype Wood, Bagshot, v.c. 8.

Carychium minimum Müller.

Bedwyn Common, v.c. 7.

Ancylus fluviatilis Müller.

This very local Wiltshire species was observed in fair plenty in a stream at Great Bedwyn, v.c. 8.

Planorbis umbilicatus Müller.

In a stream at Great Bedwyn, v.c. 8.

Physa fontinalis L.

In a stream at Great Bedwyn, v.c. 8.

Vivipara vivipara L.

Var. *efasciata* Pickering.

In the Kennet and Avon Canal, near Savernake, v.c. 8.

Pomatias elegans Müller.

Plentiful in hedge-banks at Great Bedwyn, v.c. 7 and v.c. 8.

The following varieties were also noticed :—Var. *fasciata* Picard, v.c. 7 ; var. *pallida* Moq., v.c. 7 ; and var. *maculosa* Moq., v.c. 8.

Unio pictorum L.

Abundant in the Kennet and Avon Canal between Great and Little Bedwyn, v.c. 7 and v.c. 8.

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EDITORIAL NOTES.

DR. HENRY LAVER, who joined the Conchological Society in 1879, died at Colchester on 7th September last in his 88th year. He was a well-known antiquary, an authority on local history and architecture, and ex-president of the Essex Archæological Society, to whose Transactions he was a regular contributor. The only article he ever wrote for this *Journal* was a short one in vol. i., p. 264, entitled—"Suggestions for finding the smaller Land Shells." He wrote a work on the "Mammals of Essex." Dr. Laver was Hon. Curator of the Colchester Museum and senior Alderman of the Corporation. He held the office of Mayor in 1885-6. He was also chairman of the Colne Fishery Board, which manages the oyster fishery for the Corporation, and was for many years a prominent figure at the Colchester Oyster Feasts, held annually until the outbreak of the war.

A much needed and invaluable paper of some 80 pages on "The Post-Pliocene Non-Marine Mollusca of Ireland," by A. S. Kennard and B. B. Woodward, appeared last year in the Proc. Geol. Assoc., vol. xxviii., pt. 3, pp. 109-190. The information given is a detailed and exhaustive summary of what is so far known, though, as they say, there is a vast field in Ireland for future workers and only the fringe of the subject has been touched. Complete lists of species are given for the sections examined, followed by a series of extremely interesting critical notes on certain families, genera and species. The authors conclude with an excursus on the origin of the Irish non-marine molluscan fauna, and draw certain important deductions—for instance, that practically all the species existed in Ireland in pre-glacial times and survived the glacial period; and that there has certainly been no land connection between Great Britain and Ireland since glacial times. The paper is accompanied by a folding table of twenty columns, showing the fossil and recent distribution of each species.

The recently issued part 23 of Mr. Taylor's Monograph will have been received by all with very mingled feelings, owing to the notice which appears on the cover that publication is suspended until the conclusion of the war. We are always asking for more of this splendid work, and Mr. Taylor has our hearty sympathy in the bitter disappointment which it must be to him to make this announcement.

The present part contains 48 pages of text and 4 plates, and the figures of *Theba cantiana* strike us as especially good. For *H. granulata* Alder a new genus *Ashfordia* is proposed, dedicated to Charles Ashford—a late member of this Society—and based upon anatomical peculiarities.

The other species monographed are *Hygromia umbrosa* Partsch, lately added by Mr. Taylor to the British list, *Theba cantiana* Mont. and *T. cartusiana* Müller. With the last he was inclined to unite the Levantine *Theba syriaca* Ehrenb., a course which hardly commended itself to those familiar with this species, but he has since reconsidered this view in an interesting article in "The Naturalist," 1918, p. 25. We are not satisfied that *Hygromia umbrosa* really occurs in Switzerland, in spite of Clessin's "Verbreitung: im ganzen Gebiete." It is very strange that Westerlund, an incomparably better authority than Clessin, writing two years later, does not record it as Swiss at all.

"Shells as Evidence of the Migrations of Early Culture," by J. Wilfrid Jackson (University Press, Manchester: price 7/6 net).

The publication of this interesting and well illustrated volume has been heralded and announced in our advertisement columns. It is the second of an ethnological series now appearing under the auspices of Manchester University and is replete with information which concerns the conchologist and with references to the literature consulted.

The main body of the work is divided into four chapters: the first deals with the geographical distribution of the shell purple industry and we note that *Murex trunculus* L., *M. brandaris* L., *Purpura hæmastoma* L. and *P. lapillus* L. are all considered to have been used in Europe as sources of the dye. Chapter ii. deals with Shell-trumpets and chapter iii. with the use of Pearls and Pearl-shell. Chapter iv. gives us an exhaustive account of the use of Cowries for currency, amulets and charms. One of the most striking features which Mr. Jackson's book brings out—as it is, of course, intended to do—is the universality of the usages discussed, practically all over the world. We congratulate the author heartily on having produced so complete and well-arranged a compendium of his subject.

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Helix pisana Müll. **at Swansea.**—I read Mr. J. Davy Dean's notes on *Helix pisana* in the *Journal* of July 1st, 1916, with much interest. The statement that Dr. Gwyn Jeffreys' attempt to establish a colony at Swansea was a failure is, however, incorrect. It is true that living specimens are not now to be found on the golf links at Blackpill, but a small colony still maintains itself on the seaward slope of the L. & N.W. railway embankment which faces south-west. The area only measures 150 yards by 5 yards now-a-days, as the sandy slope has been faced up with slag and limestone slabs in recent years. I enclose three living specimens which I collected as recently as August 20th this year, and yellow ragwort or flea-bane, small storksbill, bramble sea-holly and marram are the chief plants. This is also the only locality for several miles, as far as I know, for *Cochlicella barbara*, which is present in small numbers. Was this also introduced accidentally at the same time as *H. pisana*?—H. E. QUICK (*Read before the Society*, Sept. 13th, 1916).

Testacella maugei var. **viridans** Morelet **at Porlock Weir in West Somerset.**—While planting potatoes a few days ago I turned up a fine specimen of this variety. The bright apricot-coloured ventral disc contrasts strongly with the bronze-green of the dorsal surface, rendering it far more conspicuous than the earth-coloured type. Unfortunately the colouring was soon lost when the animal was placed in spirit. It is, perhaps, worth mentioning that this slug was obtained on ground which had been pasture until last year and that it is some distance from any flower garden. There is a patch of vegetables in an adjoining field but it seems very unlikely that *Testacella* should be introduced with these, most of which are raised from seed locally. The potato patch is situated on the edge of the cliff above the Bristol Channel, close to the spot where the only known Holocene shell of *T. maugei* (recorded by Mr. A. S. Kennard) was obtained There is no trace of the deposit now; the sea having encroached considerably in recent years has probably swept it away.—NORMAN G. HADDEN (*Read before the Society*, June 13th, 1917).

Limnæa glabra var. **albida** nov., **and Planorbis vortex** var. **albida** nov. —It may be of interest to place on record two whitish varieties of freshwater shells which appear to have hitherto escaped notice. Both are in my own collection, and are as follows :—*Limnæa glabra* var. *albida*, Beswick, Manchester (coll. T. Rogers) ; these are exceptionally large examples of the species ; and *Planorbis vortex* var. *albida*, drain near River Cam, Cambridge (coll. J. W. Jackson, Oct. 1912).—J. WILFRID JACKSON.

Thread-Spinning in Physa heterostropha.—In February last I obtained a number of *Physa heterostropha* from the Bolton Canal, between Agecroft and Clifton, Lancs., and placed them for some days in a glass tank of clear water some ten inches in depth. I was pleased to find that in a day or two the tank was filled by fine threads, descending from the surface of the water, most of the threads being used by the *Physa* in ascending and descending. Though thread-spinning is well known in *Aplecta hypnorum*, *Physa fontinalis*, and many other freshwater species, I can find no reference to its occurrence with regard to *P. heterostropha*. —J. WILFRID JACKSON.

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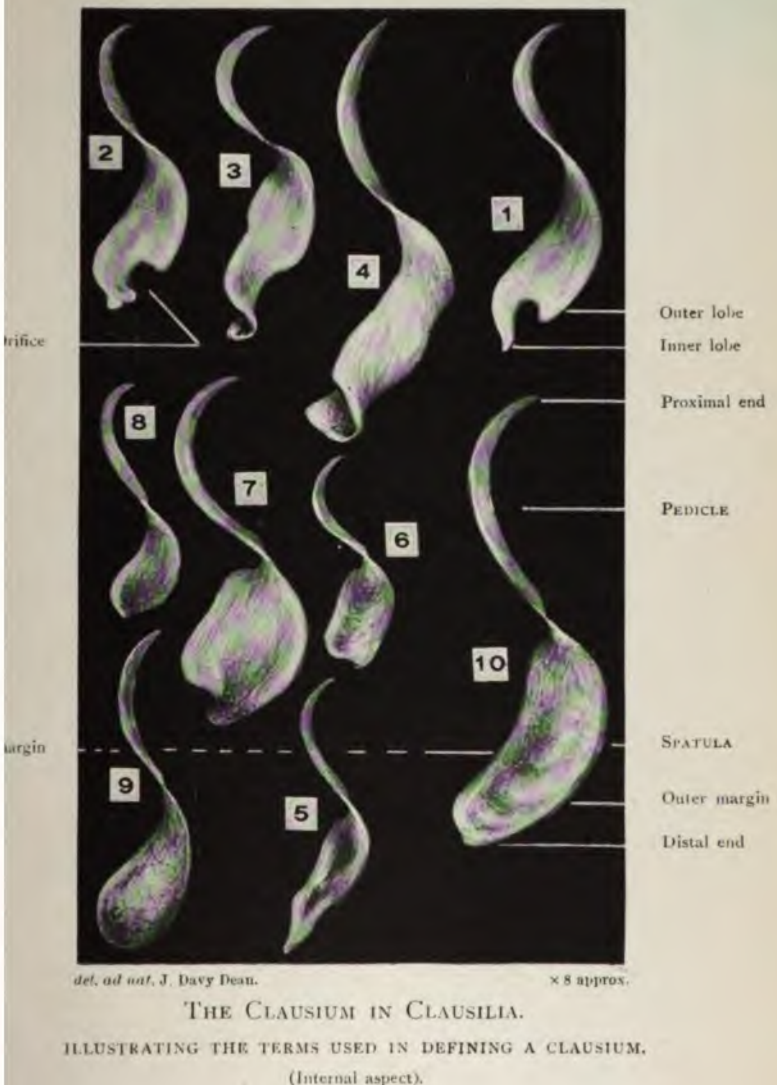

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THE CLAUSIUM IN CLAUSILIA.

ILLUSTRATING THE TERMS USED IN DEFINING A CLAUSIUM.

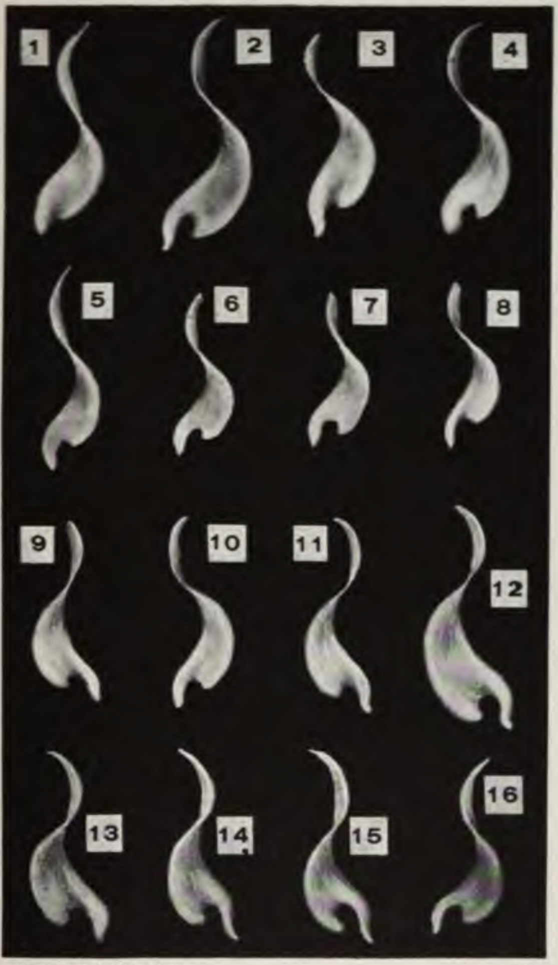
(Internal aspect).

Types of the Clausium.

FIG. 1. Bilobate.
,, 2. Emarginate.
,, 3. Reflexed.
,, 4. Reflexed (*Garnieria*).
,, 5. *Rostrate.*

FIG. 6. Truncate.
,, 7. Inflexed and Truncate.
,, 8. Inflexed.
,, 9. Clavate.
,, 10. Remiform.

JOURNAL OF CONCHOLOGY, VOL. 15, NO. 9, MAY 1ST, 1918. PLATE 6.



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THE CLAUSIUM IN ALOPIA.

ILLUSTRATING THE VARIATION IN THE CLAUSIUM AND ITS USE AS A GUIDE TO SPECIFIC VALUES.

(Internal aspect).

FIG. 1. *guicciardi* Roth.
,, 2. *plumbea* Rossm.
,, 3. *straminicollis* Parr.
,, 4. *regalis* M. Bielz.
,, 5. *jickelii* Kim. v. *occidentalis* Bielz.
,, 6. *deubeli* West.
,, 7. *elegans* E. A. Bielz.
,, 8. *canescens* Parr.
,, 9. *lischkeana* Parr.
FIG. 10. *fussiana* Bielz var. *insignis* Bielz.
,, 11. *fussiana* Bielz var. *pruinosa* Charp.
,, 12. *meschendörferi* Bielz.
,, 13. *bielzi* Pfr.
,, 14. *potaissanensis* Kim.
,, 15. *madensis* Fuss.
,, 16. *bogatensis* E. A. Bielz.

THE

JOURNAL OF CONCHOLOGY.

VOL. 15. SEPTEMBER, 1918. No. 10.

THE PISIDIUM FAUNA OF THE GRAND JUNCTION CANAL IN HERTS. AND BUCKS.

BY A. W. STELFOX, M.R.I.A.

(Read before the Society, January 9th, 1918).

PLATES 7, 8, AND 9.

THE opinions expressed in the following paper regarding the identity of some of the shells are put forward tentatively, and yet with confidence; tentatively because they differ in some cases fundamentally from those in the most recently published work on the British *Pisidia* (1); with confidence because the available evidence supports them. This evidence is based on the study of much material, in addition to that dealt with in this paper, which has been supplied by the kindness of several correspondents, who not only sent me the specimens already in their collections, but also specially collected material, which they forwarded to me alive for examination. To these correspondents I am deeply indebted, and I tender them my thanks.

The paper deals with the species of the genus *Pisidium* which are found in that portion of the Grand Junction Canal—a stretch of approximately nine miles—which crosses the chalk range of the Chilterns between Berkhamsted in Hertfordshire and Cheddington in Buckinghamshire, and attains at the highest point an altitude of nearly 400 feet. The origin of the present paper may be traced to the finding of *Pisidium parvulum* in sand dredged from the rivers Barrow, Suir, and Shannon in Ireland (4).

In the early months of 1916, Mr. Phillips and I were in need of young examples of *P. supinum* for comparison with our Irish specimens of *P. parvulum*, and I wrote to Mr. Charles Oldham asking him to collect *P. supinum* of all ages, and suggested that he should at the same time look out for *P. parvulum*, as some shells in my possession from the Pleistocene deposits at Grays, Essex, were, in our

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Numbers in brackets refer to works mentioned in the Bibliography at the end.

opinion, referable to a robust form of that species, though sent to me as the young of *P. supinum*.

In July Mr. Oldham sent me examples of *P. supinum* from the Grand Junction Canal at Dudswell, near Tring, Herts., amongst which I detected a single example of *P. parvulum*. During the next few weeks he sent me many shells from Dudswell and Wilstone in Herts., and from Marsworth and Cheddington in Bucks. At each of these places *P. parvulum* occurred in association with *P. supinum* and other species of the genus, and we were convinced that Mr. B. B. Woodward had been mistaken in referring our Irish shells to the young of *P. supinum* as he had done (in litt.). At a later date and after further examination, Mr. Woodward agreed that some of our Irish specimens were referable to *P. parvulum*, but maintained that the shells from the Grand Junction Canal and from the Pleistocene deposits of the Thames Basin were clearly young *P. supinum* (see Ann. Mag. Nat. Hist., ser. 8, vol. xviii., pp. 346–348, 1916). To my mind *P. parvulum* even in its most robust form does not closely resemble the young of *P. supinum*, and it is strange that the two should ever have been confused (*cf.* figs. 14–21, with 22–25, pl. 8), but proof of their diversity, if it were required, exists in the fry which we have taken from the shells of *P. parvulum*, collected at different places in the canal, the parent shells being no larger than very juvenile *P. supinum*.

Among the shells sent to us by Mr. Oldham were several which at the time we could not identify, although we inclined to the belief that they were merely thickened forms of common species, analogous to the thickened forms reported from the Pleistocene of the London Basin, and which still live in the Thames. So peculiar a facies had the *Pisidia* from the canal, that it seemed worth while to investigate them on ecological lines. Mr. Oldham undertook to obtain the necessary material, and during 1917 collected extensively in several carefully selected and restricted habitats in the canal. He forwarded many of his takings to me alive, and whilst the task of working out the identity and affinities of the different species has fallen to me, I am permitted to say that the views expressed in this paper are shared by Mr. Oldham and Mr. Phillips, with whom I have been in constant touch during its preparation.

The Grand Junction Canal was constructed about the year 1800. Leaving the Thames at Brentford, it runs northward up the valley of the Colne, and after crossing the Chilterns, traverses the drainage areas of the Great Ouse and Nene. The main sources of its water supply are the large reservoirs near Tring, and streams in the system of the Colne, Great Ouse, and Nene.

I suggested to Mr. Oldham that gatherings should be made from certain well-marked and circumscribed habitats, so that we might be in a position to compare from different stations the various forms that live in association with one another. The bed of the canal is for the most part stony, but here and there, particularly at places just above lock-gates, there are deposits of chalky mud, sometimes several feet in depth. The surface layer of these muddy patches is in a constant state of disturbance owing to the frequent passage of boats—many of them self-propelled—and the currents set up by the opening and shutting of the lock-gates. This agitation probably accounts for the paucity of plant life on the muddy patches; but a few plants do occur, the most common being *Potamogeton pectinatus*, *P. perfoliatus*, and *Elodea canadensis*. These patches of mud are the chief strongholds of the Pelecypod fauna of the canal, and obviously offer more convenient collecting-grounds than the stony bed in other parts. Besides the *Pisidia* occur *Sphærium rivicola*, *S. corneum*, *S. lacustre*, *Anodonta cygnea*, *Unio pictorum*, and *U. tumidus*. The five stations from which the material was obtained were areas of a few square feet in patches of mud at the following places:—

(1). Above lock, S.W. of Berkhamsted railway station (Herts.).
(2). Above the Cowroast lock, Dudswell (Herts.).
(3). Above lock, N. of Wilstone village (Herts., Aylesbury branch of canal).
(4). Above lock, S. of Hospital Farm, Marsworth (Bucks.).
(5). N.W. of Marsworth Church (Bucks.).

The swirl caused by the working of the locks has its disadvantages, for it brings together various varieties of several species (*e.g.*, of *P. casertanum* and *P. nitidum*), which probably would not, in a state of nature, be found in association. In rivers like the Thames this state of affairs is naturally to be met with, but the occurrence of it in the cânal made us think at one time that the extreme forms of *P. casertanum* and *P. nitidum* must be distinct species, owing to the fact that they were found to live with practically typical examples of their respective species. Further research has made us feel justified in believing that they are varieties produced by their having lived under various conditions of environment and that they have come to associate with their respective types by some disturbance of the canal bottom, possibly by the action of the self-propelled barges which are now in common use on the canal.

The origin of these well-marked varieties which are found in association is obscure, but a possible explanation is that at some places in the canal decaying vegetable matter collects, whilst at others occur shifting deposits of chalky mud or silt with scarcely any vegetation, and in consequence the environment of shells living within a few yards of one another is widely different. In a group so easily influenced by their surroundings, as are the *Pisidia*, it is not surprising that various forms of the same species should occur in the canal, nor, in view of the traffic which passes up and down this particular waterway, that these various forms should at times come to be associated. An alternative explanation has been suggested by Mr. Phillips, namely, that these varieties may have arisen in different habitats, and by long continued habitation of these their characters may have become so fixed that on reaching the canal the various forms have continued to perpetuate their individual characteristics.

The ecology of the *Pisidia* of the district seems to be of great interest, for while all the species which Mr. Oldham has found in the canal occur at most of the stations, certain common species, though living in close proximity to the canal, must either be very rare in or absent from it, as they have not been detected in it so far. For example, *P. personatum* lives in ditches at Cheddington, Wilstone, and Bulbourne, which are only separated from the canal by the towing path. In Marsworth Reservoir, which is only separated from it by an embankment, two further species live, namely, *P. milium* and *P. obtusale*; while a fourth, *P. pulchellum*, occurs abundantly in a tank in which logs are soaked on the bank of the canal at Rickmansworth, Herts., somewhat outside our special area. A fifth is found in two habitats near Watford, Herts., also outside the limits of our area; this is *P. hibernicum*,[1] which has been taken by Mr. Oldham in a stream at Cassio Bridge and in a fish-pond at Aldenham Abbey. With the exception of *P. personatum*, which is not often found in habitats such as the canal, there appears to be no reason why the other four species just mentioned should not also find a place in its fauna.

This fauna as we know it to day comprises no less than eight species of the genus. Of these, *P. casertanum*, *P. nitidum*, and *P. subtruncatum* are widely spread throughout the British Islands and occur in many kinds of habitats. *P. amnicum*, *P. henslowanum*, *P. supinum*, and *P. parvulum* are more generally confined to streams, rivers, or canals, and appear to be absent from the extreme northern parts of Great Britain and from many of the western districts in Ireland. The eighth species appears to be new to science and is described below: *P. tenuilineatum mihi.* With the curious exception of *P. henslowanum* all these species are represented in the canal for the most part by very thickened and somewhat triangular varieties,[1] and these are the more interesting as no less than four of them appear to be included in Mr. Woodward's Catalogue, as forms of his *P. supinum.*[2] In making this statement I am not relying altogether on Mr. Woodward's figures, but upon specimens on which records given in his Catalogue are founded. Thus the form of *P. supinum* most common in the canal is that referred to by Mr. Woodward as the very triangular form of *P. supinum* ; some of what he regards as the young of this are, in my opinion, the thickened form of *P. parvulum* ; whilst my *P. nitidum* var. *crassa* is styled by him "*P. supinum* (ovate form)," and is figured in his Catalogue, plate xxv., fig. 10b. Finally, what Mr. Woodward refers to as the inappendiculate form of *P. supinum* would appear to be the shell I here describe as *P. casertanum* var. *ponderosa.*[3]

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[1] Since the paper was read Mr. J. E. Cooper has taken specimens of *P. hibernicum* and *P. obtusale* in the canal, much to the south of our district, at Denham Lock.

SYSTEMATIC NOTES.

P. amnicum (Müller). Plate 7, figs. 35–39.

The form which lives in the canal is somewhat thickened and generally strongly striate or almost ribbed.

P. casertanum (Poli) B. B. Woodward. Plate 7, figs. 24–34.

Numerous forms live in the canal. Three of these differ so markedly that at first I was almost inclined to look upon them as three distinct species, especially as in several gatherings forwarded to me alive by Mr. Oldham all three occurred in association.[4] This phenomenon may possibly be explained by the fact that the traffic on the canal stirs up the mud, and thus forms formerly living under different conditions of environment come to be found in association, just as they would be brought together in rivers during floods. Or, as Mr.

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[1] For some time Mr. Phillips has held that *P. supinum* is this missing, thickened form of *P. henslowanum*, corresponding with my varieties *crassa* of *P. nitidum* and *ponderosa* of *P. casertanum*, which as Mr. Phillips so truly points out, are always to be met with where *P. supinum* occurs. With Mr. Phillips's view I am in full agreement, but it is too big a matter to be discussed at length in the present paper. I may say, however, that the only alternative I can see to regarding *P. supinum* as a variety or perhaps sub-species of *P. henslowanum* is to raise the thickened forms of all the other species to specific rank also. It may be stated that Mr. Phillips's suggestion is not new, since Malm regarded specimens he had received from the original habitat for Schmidt's species—the River Panke, near Berlin—as being at most a thick-shelled, local race of *P. henslowanum.*

[2] See Oldham on the various forms of Mr. Woodward's *P. supinum*, *Journ. of Conch.*, vol. xiii., p. 53.

[3] Since this paper was read before the Society I have received, by the kindness of the author, a copy of Herr C. M. Steenberg's Monograph on the Mollusca of the Fure Lake in Denmark. From this it would appear that a similar form of *casertanum* has been mistaken for *P. supinum* in his country, as in this.

[4] In this connexion it is interesting to note that Herr Steenberg records (*loc. cit.*) three forms of this species from the Fure Lake in Denmark—a typical form, a thickened triangular form, and one he refers to as "f. *lacustris* B. B. Woodward."

Phillips suggests, they may be distinct races derived from different sources and breeding true in the canal. Additional material and a study of living specimens has convinced me that all these varieties are merely well-marked phases of this plastic species. Exteriorly, all are similarly sculptured, the striation being very fine (close) and somewhat irregular, and although there is a good deal of variation in the siphons, this variation was found to bear no relation to the form of the shells. All the forms are more or less thickened, but as they approach the triangular shape the thickening becomes more pronounced. Continental authorities appear not only to have created numerous species out of the multiple forms of *P. casertanum*, but to have ascribed some of its varieties to other well-known and perfectly distinct species, and so increased the chaos in which the whole group is involved. The form in the canal which most nearly approaches the type, as figured by Mr. Woodward, is rare. It is somewhat similar to that found in Marsworth Reservoir—plate 9, figs. 29-30—but is a little more oval. The smaller, shouldered form, which is common—plate 7, figs. 24–25—is very similar to shells taken by Mr. Phillips in Lough Rea, Co. Galway, which have been identified and recorded by Mr. Woodward in his Catalogue as *P. steenbuchii* (Möller). The third phasis of this shell which lives in the canal—my var. *ponderosa*—plate 7, figs. 31–34—may prove to be the supposed inappendiculate form of *P. supinum* mentioned by the describer of that species, Adolph Schmidt, Clessin and other authors. Although the multiplication of varietal names has many objections, I feel that there is no alternative but to provide names for the above very definite stages in the variation of *P. casertanum*, the origin of which, I think, will be traced eventually to their early environment.

var. **humeriformis** nov. Plate 7, figs. 24–25.

Smaller than the type, more tumid, more squarrose, the dorsal outline having a distinctly shouldered appearance; hinge similar to that of the type but rather shorter and more arched owing to the shape of the shell; ligament pit shorter and broader than that of the type for the same reason [*humeriforme* on pl. 7 by error].

Habitat:—In the Grand Junction Canal, near Marsworth Church, Bucks. This variety occurs also in the Thames, and in some rivers and lakes in Ireland. It seems to live in water in which there is not much decaying vegetable matter. As a general rule shells of this variety are thick and heavy, but thin-shelled forms with a similar outline, though less tumid, occur in certain districts.

var. **ponderosa** nov. Plate 7, figs. 31–34.

Larger than the last variety, more triangular, and very much thick-d, even more tumid and the hinge more arched; and the ligament still shorter.

Iabitat:—In the Grand Junction Canal at Cowroast Lock, Duds-, Herts. It is also found in the Thames, and in the Barrow, e, and Suir in Ireland, and is no doubt to be found in most of larger river basins where the water contains a sufficient quantity alcareous matter. The old theory that these thick-shelled forms e *Pisidia* are produced by running water appears to be a myth. variety may be distinguished from *P. supinum*, for which it ld appear to have been mistaken more than once, by its shorter broader ligament pit, its broader umbones, much closer and irregularly placed striæ, as well as by the fact that it is never ndiculate.

itidum Jenyns. Plate 7, figs. 5–13.

puzzling series of forms of this shell occurs in the canal, the thickened one of which I was unable to identify at first owing s more or less globular shape, small umbones, and very coarse tion. In the first and second character it resembles *P. hiber-n*, while in the third it approaches *P. pulchellum*. More or less al shells are also found in the canal, though these are rare, and ous forms intermediate between them and the thickened one tioned above also occur, so that I now feel justified in regarding latter as the thick-shelled representative of this species and giving e title *crassa*.

var. **crassa** nov. Plate 7, figs. 5–8.

naller than the type, more globular, thicker, hinge more arched, the lateral teeth much shorter and stouter, striæ generally more gly marked, so that the usually distinct grooves across the um-s are not very noticeable; umbones smaller and more prominent; on similar.

abitat:—In the Grand Junction Canal, near Marsworth Church, ts. A similar form is abundant in the Thames, but the shells that river are not as a rule so strongly striate. A specimen able to this variety, though not quite typical of it, taken by Mr. am in the canal at Marsworth in 1906, is figured in Mr. Wood-'s Catalogue—plate xxv., fig. 10b—as a form of *P. supinum*. The inder of the gathering is in Mr. Oldham's collection labelled in Woodward's writing: "*P. supinum* (ovate form)." The var. *a* may be distinguished from *P. supinum* by its more equilateral e and outline, smaller cardinal teeth, very short and broad liga-

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See note added in press on page 302.

This description might be thought to fit Jeffreys's *P. nitidum* var. *globosa*, but that shell lly a form of *P. obtusale*, as pointed out by Mr. Woodward (Catalogue, page 11).

ment pit, its funnel shaped siphon, as well as by its glossy, usually strongly striate and always inappendiculate shell.

P. subtruncatum Malm. Plate 7, figs. 1–4.

A small, thickened and rather tumid form, with the umbones placed close to the posterior end, is found in the canal. In this the short-curved cardinals are quite unlike those of the common form of the species, in which these teeth are very long and almost straight. It is less abundant than the other species.

P. tenuilineatum species nova. Plate 8, figs. 1 and 4–13.

Animal albescens; siphone magno, brevi.

Testa oblongo-ovata, tumidissima, valde incrassata, inæquilateralis, antice aliquantum prolongata, postice truncata, infra magnopere arcuata, regulariter striata; umbones prominentes, rotundati, haud appendiculati; cardo valde incrassatus; dentes laterales validi, parum elevati, mucronibus vix prominentibus.

P. tenuilineatum differt a P. parvulo, dente posteriore tertio (p. III.) *nec intro incurvato nec in primum* (p. I.) *ad umbonem versus incidente, et siphone multo majore.*[1]

ANIMAL whitish; SIPHON large, very short, orifice narrowly elliptical, margin of the tube fringed and slightly reflected at its fullest expansion; FOOT very extensile, narrow and long.

SHELL small, about 1·8 × 1·4 × 1·1 mm., oblong oval, very tumid, greatly thickened; STRIÆ exceedingly regularly spaced and resembling carefully ruled lines; UMBONES prominent, round, without appendiculæ, placed towards the posterior end; DORSAL MARGIN sloping quickly and about equally on both sides of the umbo, and passing gradually into the anterior and posterior margins; ANTERIOR MARGIN bluntly pointed; POSTERIOR MARGIN somewhat truncated; VENTRAL MARGIN curved; HINGE much thickened, with the interior lateral teeth very strongly developed, and the interior outline of the hinge-plate greatly arched; TEETH IN THE RIGHT VALVE:—*c. 3* bent, the posterior portion thickened and somewhat clavate; *a. I* and *p. I* almost at right angles to the axis of the hinge-plate under the umbo, thickened and showing opaque lines of growth, cones sometimes splayed inwards and only slightly conical; *a. III* and *p. III* upright or leaning against the shell-wall, long and ridge-like, with the cones scarcely developed; TEETH IN THE LEFT VALVE:—*c. 4* greatly curved; *c. 2* leaning towards the umbo and sometimes almost prostrate—in which case the upper surface is furrowed and it resembles *c. 2* of *P. amnicum*—dying away anteriorly in a low ridge, part of which usually crosses the umbonal end of *a. II*[1] (this ridge is complementary to a similar feature in the right valve, which originates along the inner margin of the hinge-plate under *c. 3* and dies away into the shell wall above the upper end of *a. III*); *a. II* and *p. II* long, straight, and stoutly built, with the cones fairly prominent but rounded; ligament pit comparatively large, bounded below by a faint, somewhat sinuous ridge; at its maximum breadth the ligament pit is almost the full width of the hinge-plate; between the ligament pit and the cardinal teeth, in each valve, there is a slight hollow cutting into the hinge-plate.

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[1] I have to thank Mr. J. R. le B. Tomlin for rendering this brief description into Latin.

FRY oval, almost smooth, about ·5 × ·3 mm., and not so compressed as are the young of most species of the genus.

HABITAT :—In the Grand Junction Canal, near Marsworth Church, Bucks., and other places. Considering that *P. parvulum* has now proved to have quite a wide range in the south midlands of England, though overlooked until 1916, it is not surprising that this small shell has also been passed by, since it would appear to be less common and not so widely distributed in these islands. The first specimens to be detected were three sent by Mr. Oldham amongst a set of *P. parvulum* from the canal at Cheddington. They were easily picked out from that species by their beautiful striation, and were laid aside as probably the young of some other inhabitant of the canal; but an examination of the other species at once showed that this was not the case, and among further specimens collected by Mr. Oldham it was observed that the larger and older shells were eroded like the fully-grown examples of the other *Pisidia*. In 1916 I was satisfied that Mr. Oldham's second gathering included mature specimens and that it was a distinct species. In the autumn of 1917 the former conclusion was confirmed, as on boiling a medium sized specimen, about 1·6 mm. in length, I obtained from it two fry. As I have been unable to find a description of any known species which fits it, I have decided to name it by the character that first drew my attention to it—namely, its wonderfully regular and line-like striæ.

Systematically it is difficult to place. Exteriorly it is not unlike the young of the tumid forms of *P. subtruncatum* that occur in the canal, though interiorly it more nearly resembles *P. parvulum* in its hinge characters. *P. tenuilineatum* may be distinguished from young, thick-shelled *P. subtruncatum* by its more regular and strongly-marked striation, smaller and more curved cardinal teeth, and by its lateral teeth being almost equi-distant from the cardinals—in *P. subtruncatum* the anterior teeth are much nearer to the cardinals than the posterior ones. From *P. parvulum* it differs in its siphon, in its larger *c. 3*, which resembles slightly that of *P. casertanum*, and in the fact that *p. III* does not curve inwards towards the umbo to meet *p. I*, but on the contrary runs on parallel to it and dies away under the ligament pit.

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[1] If a thin-shelled form of *P. tenuilineatum* exists it is unlikely that this feature will be found in it, since similar ridges occur in thickened forms of other species, though not appearing in normal shells of the same species.

Since the discovery of this species at Cheddington, Mr. Oldham has taken examples at Marsworth in the same county, and in 1917 found it in the canal at Stoke Bruerne, Northamptonshire, and in the Northampton branch of the canal at Rothersthorpe. A specimen from the latter locality is the largest I have seen and has all the appearance of being greatly overgrown. It measures 2·0 × 1·7 × 1·2 mm., and is not so thickened as the type. Its cardinals are remarkably developed, *c. 3* being distinctly bifurcate, and its *c. 2* resembles that of some *P. amnicum* (*cf.* plate 8, figs. 4 and 5). It is most improbable that this little species is confined to the canal and it is almost certain to turn up in the Thames, Great Ouse, and other rivers. It should also be found in the Pleistocene deposits of the London Basin in which all its associates occur commonly. In Ireland we have looked for it in vain in the sands from the rivers that have yielded *P. parvulum* in some numbers. Collectors if searching for this or the next species should be careful to use a scoop with a very fine mesh, or these two shells will pass through it and escape notice. Mr. Oldham uses a scoop with wire gauze of 324 meshes to the square inch.

P. parvulum Clessin (?). Plate 8, figs. 2 and 14–21.

This species appears to be abundant in the canal, and was taken by Mr. Oldham in all the places selected by him for special attention, as well as at places beyond the area dealt with in this paper between Cheddington and Leighton Buzzard; and at Stoke Bruerne and Rothersthorpe in Northants. In England I have also seen it from the Pleistocene of Grays, Essex, and Crayford, Kent. In the living state it has been taken by Mr. J. E. Cooper in the Thames in several stations from Twickenham in Middlesex to Long Ditton in Surrey; and by Mr. Oldham in the Kennet and Avon Canal near Seend in Wilts. In Ireland it occurs commonly as a fossil in sand dredged from the rivers Barrow, Nore, Suir and Shannon, and no doubt still lives in all these rivers, as Mr. Phillips has recently taken it alive in the Suck, a tributary of the Shannon, near Ballinasloe, in South Galway.

Mr. Woodward regards the shells from the Pleistocene and many of our other specimens as the young of *P. supinum* (see Ann. Mag. Nat. Hist., series 8, vol. xviii., pp. 346–348, 1916), but I hope that the figures that I give of the latter will enable any conchologist to separate the two species. The coarse striation, larger umbones, and proportionately larger appendiculæ are the chief external characters by which young *P. supinum* may be separated from *P. parvulum*; the relative position of the appendiculæ is another point; while the mature aspect of *P. parvulum* and the immature appearance of *P. supinum* of similar size will strike the naturalist's eye at once, though such features cannot be put into words, translated into drawings, nor observed under the microscope. Interiorly, the well-developed ligament pit of *P. supinum*, as well as the larger cardinals, differ appreciably from those of *P. parvulum*, while *p. III* in the former species does not curve inwards to meet *p. I* as it does in *P. parvulum*. In the National Museum, Dublin, there are shells sent by Westerlund as "*P. parvulum* Clessin," from near Ronneby, Sweden, one of the original localities for the species (see Westerlund, *loc. cit.*, p. 553). These specimens do not resemble the species under consideration, which, however, is conspecific, in my opinion, with that figured by Mr. Woodward in his Catalogue as the *P. parvulum* of Clessin, and with Danish specimens under this name, kindly sent to me by Mr. Woodward in 1915. If in future, therefore, it were found necessary to drop the very appropriate name of *parvulum* for this species, another suitable one might be found in *torquatum*, derived from the little collar-like appendicular ridge which surrounds the nepionic shell in nearly all examples I have seen. This last feature is omitted, strangely, from both Mr. Woodward's description of this shell and from the original diagnosis of Clessin's species, published by Westerlund (*loc. cit.*).

P. supinum A. Schmidt. Plate 7, figs. 14–18. Also plate 8, figs. 3 and 22–25.

Abundant in the canal at many places. All the specimens are much thickened and acutely triangular in outline when fully grown. This shell may be distinguished from *P. casertanum* var. *ponderosa* by its appendiculæ, its wider, more strongly marked striation, and internally by its longer, straighter, and narrower ligament pit. From *P. nitidum* var. *crassa* it may be known by its less equilateral shape, its larger cardinal teeth, its simple tube-like siphon, by the presence of appendiculæ, and by its less glossy appearance, and different striation. The young of this species may be distinguished from mature examples of *P. parvulum* by the position of the appendiculæ in relation to the rest of the shell, as well as by their different shape and larger size. In young *supinum* the cardinal *c. 3* is larger, the ligament pit is more strongly marked, straighter, and longer, while exteriorly the shell is much more widely and coarsely striate than in *P. parvulum*.

P. henslowanum (Sheppard). Plate 7, figs. 19–23.

Alone of all the *Pisidia* in the canal, this remains for some obscure reason without a thickened shell. A very remarkable fact, and one that gives much food for thought. It occurs everywhere, and is constantly associated with the heavy-shelled forms of the other species.[1]

APPENDIX.

Containing a list of the species of *Pisidia* which occur in the district through which the canal runs, but which have not yet been found living in it.

P. personatum (Malm) B. B. Woodward. Plate 9, figs. 23–26.

Is frequent in the district, and lives right up to the edge of the canal in drains and ditches.

I believe this to be the *P. pusillum* of Jenyns, and most British authors,[2] though they confounded forms of *P. casertanum* with it, and perhaps other species. Clessin (3) and Westerlund (2) refer to Malm's *personatum* as a variety of *P. obtusale*, and it may be remarked that Malm's diagnosis cannot be said to fit the species here intended.

P. obtusale (Lamarck) Jenyns. Plate 9, figs. 9–12.

Plentiful in Marsworth Reservoir, associated with *P. casertanum*, *subtruncatum*, *milium*, and *nitidum*. It is also frequent throughout the district in ponds, etc.

P. milium Held. Plate 9, figs. 5–8.

Common in Marsworth Reservoir and frequent in the district.

P. pulchellum Jenyns. Plate 9, figs. 13–16.

The nearest stations discovered by Mr. Oldham for this species are the tank at Rickmansworth, mentioned in the first part of the paper, and a fish-pond at Aldenham Abbey, both habitats being in Herts.

P. hibernicum Westerlund. Plate 9, figs. 1–4.

A thin form has been taken by Mr. Oldham in a brook bordering the towing path at Cassio Bridge near Watford, and again in a fish pond at Aldenham Abbey, Herts., both stations being outside the area dealt with in the paper. Mr. Oldham informs me that he considers the shells of Jenyns's *P. obtusale* var. *β* preserved at Bath to belong to the present species and it is interesting to think that Jenyns recognised its distinctness sufficiently to refer it to a variety of one of his species. It is not a rare shell and is generally associated with *P. nitidum*, *subtruncatum* and *milium*, and sometimes with other species. It may be distinguished from the associated specimens of its nearest ally, *P. nitidum*, by its smaller and more prominent umbones, delicate though well-marked striation, its narrow tube-like siphon and its longer cardinal teeth; especially by its *c. 2* which is sometimes twice as long as that of the associated *P. nitidum*. In most of the lowland forms of the species the lateral teeth are not greatly twisted, this character in the type being produced by the abnormal tumidity of that form, which unfortunately is a most aberrant one. From *P. obtusale* it may be separated by its smaller umbones, which are generally more centrally placed, its more regular and rather stronger striation and its much longer *c. 2*; but the chief character, and the simplest, which distinguishes it from that species is its *p. III*, which does not tend to coalesce with *p. I* towards the umbo. In some cases it tends to approach *P. milium* in general appearance, but the ventral margin of *P. hibernicum* is much more curved than in *P. milium* and the ligament pit of the latter is longer and straighter. The animal of *P. hibernicum* is frequently of a bright rose pink colour.[1]

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[1] For a possible explanation of this remarkable fact see footnote on page 293 *supra*.

[2] See 5, in bibliography. Also note page 302 below.

[**P. steenbuchii** (Möller). Plate 9, figs. 17–20.

A single shell collected by Mr. J. E. Cooper at Boveney, Bucks., has been referred to Möller's species by Mr. Woodward, and is recorded in his Catalogue. p. 110, from this locality, though for some reason the record is omitted from the map of distribution on the same page. By the kindness of Mr. Cooper I have been able to examine this unique specimen, as well as to make drawings of it, which latter will be found figured on plate 9. A comparison of my figures with the diagrammatic figures of Mr. Woodward's *P. steenbuchii*—Catalogue, plate II, fig. 7—will show that there is not very much similarity between them. The Boveney shell, I would suggest, is a rather uncommon variety of *P. nitidum*[2]; somewhat similar specimens occur in the Thames and occasionally turn up in other districts.]

LIST OF PAPERS AND WORKS REFERRED TO ABOVE.

1. Catalogue of the British species of Pisidium (Recent and Fossil) in the collections of the British Museum (Natural History), with notes on those of Western Europe. By B. B. Woodward, F.L.S., &c. London. 1913.

2. Fauna Molluscorum terrestrium et fluviatilium Svecæ, Norvegiæ et Danæ. By C. A. Westerlund. Stockholm. 1871-73.

3. Deutsche Excursions Mollusken Fauna. By S. Clessin. Nürnberg. 1885.

4. On Two Species of Pisidium (Fossil) New to Ireland (*P. supinum* and *P. parvulum*). By R. A. Phillips, M.R.I.A. *Irish Naturalist*, vol. xxv., pp. 101–105, pl. 2, 1916.

5. On the recent misapplication of the names *P. pusillum* and *P. nitidum* of Jenyns. By A. W. Stelfox, M.R.I.A. *Journal of Conchology*, p. 235 *ante*. 1918.

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[1] For a fuller description of *P. hibernicum* and figures see R. A. Phillips and A. W. Stelfox on "Recent extensions of the range of *P. hibernicum*," *Irish Naturalist*, vol. xxvii., pp. 33–50, plates 1 and 2, 1918.

[2] See note below.

[Note added in the press]. Since the present paper was read, a reply to my contention (5) that Mr. Woodward's *P. pusillum* and his *P. personatum* are respectively the *P. nitidum* and *P. pusillum* of Jenyns has been published in this Journal (p. 260 *ante*). In this Mr. Woodward confines himself mainly to a denial of my contention and to matter the revelancy of which I have so far failed to appreciate, but he adduces evidence which in my opinion supports my view. Thus he says "*P. pusillum*, as I understand it, is common in Ireland, and especially fine in the shell-marl deposits." Our Irish shell-marls are essentially "open water" deposits, being mainly composed of the decayed stems of species of *Chara*. If we turn now to the works of the older British authors, including Jenyns, it will be seen that their *P. pusillum* is always spoken of as inhabiting precisely the opposite kind of habitat, or that in which Mr. Woodward's *P. personatum* most frequently occurs. It is significant also that the specimens in the Hanley Collection in the British Museum labelled "*P. pusillum*, British," which Mr. Woodward thinks were probably used by Forbes and Hanley for their illustration of that species, are Mr. Woodward's *P. personatum* (Cat. p. 63). The specimen (not two specimens as stated by Mr. Woodward) of Jenyns' *P. pusillum* at Bath, referred to in Mr. Oldham's notes (p. 237 *ante*), is that figured by Jenyns in his Monograph, plate xx, fig. 4. When Mr. Woodward claims to be the first reviser of Jenyns' *P. pusillum* and states that "the idea of a type in its modern conception had not been evolved in Jenyns' time," he must have forgotten that when referring to Gray's similar proposed revision of Jenyns' composite *P. pulchellum* (Cat. p. 8) he has said: "This forcible exchange of type is not recognized now-a-days."

As regards the shell figured by me as *P. nitidum* (p. 237 *ante*), Mr. Woodward says that it is a good representation of his *nitidum* and quite unlike his *pusillum*, but I am still of the opinion, after once more making careful comparisons between this and his figures, that it agrees in all essential characters with the description and figures of his *pusillum*; and that the shell from which the diagrammatic figure of his *pusillum* was made (Cat. pl. 1, fig. 8) is conspecific with that in the Hyndman Collection in Belfast labelled *P. nitidum*. It would assist students of this group if Mr. Woodward would disclose the place, and nature of the habitats, from which the shells he has diagrammatically figured in his Catalogue were obtained, so that further specimens might be collected and these studied alive. It is my belief that only by close study of the ecology of the Pisidia in the field will their secrets be discovered. In this statement I have the support of Jenyns, who in his later paper (1858) says:—"Having, however, occasionally had shells sent to me which were erroneously supposed to belong to the species in question, I must again caution collectors gainst deciding hastily on any of these small bivalves, *without seeing he living animal.*" Part of this sentence is quoted by Mr. Woodward Cat. p. 10) but since he omits the essential portion, which I have laced in italics, he would appear to have missed the whole significance of Jenyns' remark.

DESCRIPTION OF PLATES.

To judge by the plates in Mr. Woodward's Catalogue, photography as failed so far as reproducing recognisable representations of the inges of the *Pisidia*. The figures on the accompanying plates are ased on outline drawings by camera lucida, afterwards shaded. The uthor hopes that they present the hinges of the various species as they ppear to him and that they will convey to others a better idea of the hells than the illustrations in the older works. The siphons are pproximately to scale.

Plate 7.

Figs. 1, 2, 3, 4. Interior and exterior views of the thickened form of *P. subtruncatum* from the canal at Wilstone. The short curved cardinal teeth in this form differ markedly from those of normal specimens.

Figs. 5, 6, 7, 8. Interior and exterior views of a specimen of *P. nitidum* var. *crassa* from the canal near Marsworth Church.

Figs. 9, 10, 11, 12, 13. Various forms assumed by the siphon of var. *crassa*: fig. 10 shows the siphon of a very old specimen unfolding: fig. 12 a siphon without a distinctly crenulated margin.

Figs. 14, 15, 16, 17. Interior and exterior views of a medium sized example of *P. supinum* from the canal at Marsworth.

Fig. 18. The siphon of a *P. supinum* from Marsworth.

Figs. 19, 20, 21, 22. Interior and exterior views of a very large specimen of *P. henslowanum* from the canal at Cowroast Lock, Dudswell.

Fig. 23. The siphon of a *P. henslowanum* from Marsworth.

Figs. 24, 25. Interior views of an old specimen of *P. casertanum* var. *humeriformis* from the canal at Marsworth.

Figs. 26, 27, 28, 29, 30. Variations in the shape of the siphon assumed by examples of var. *humeriformis* and the more typical form of *P. casertanum* from the canal at Marsworth.

Figs. 31, 32, 33, 34. Interior and exterior views of a specimen of *P. casertanum* var. *ponderosa* from the canal at Cowroast Lock, Dudswell.

Figs. 35, 36, 37, 38. Interior and exterior views of a specimen of *P. amnicum* from the canal near Hospital Farm, Marsworth. To a reduced scale.

Fig. 39. The siphon of a *P. amnicum* from Marsworth.

Plate 8.

Fig. 1. The siphon of a *P. tenuilineatum* from Marsworth; *a* front view, *b* side view.

Fig. 2. The siphon of a *P. parvulum* from Marsworth.

Fig. 3. The siphon of a very young *P. supinum* from Marsworth.

Figs. 4, 5. Interior views of a very large specimen of *P. tenuilineatum* from the canal at Rothersthorpe, Northants. In the left valve of this specimen the anterior ridge of *c. 2* does not cross but joins that of *a. II.*

Figs, 6. 7, 8, 9. Interior and exterior views of an abnormal specimen of *P. tenuilineatum* from the canal near Marsworth Church, having *p. III* in the left valve.

Figs. 10, 11, 12. 13. Interior and exterior views of a typical specimen of *P. tenuilineatum* from the canal at Marsworth.

Figs. 14, 15, 16, 17. Interior and exterior views of a specimen of *P. parvulum* from the canal at Marsworth.

Figs. 18, 19, 20, 21. Interior and exterior views of a specimen of the large thickened form of *P. parvulum* from the canal at Berkhamsted.

Figs. 22, 23, 24, 25. Interior and exterior views of a very juvenile specimen of *P. supinum* from the canal at Wilstone.

Plate 9.

Figs. 1, 2, 3, 4. Interior and exterior views of a specimen of a somewhat thin form of *P. hibernicum* from a fish-pond at Aldenham Abbey.

Figs. 5, 6, 7, 8. Interior and exterior views of a specimen of *P. milium* from Marsworth Reservoir.

Figs. 9, 10, 11, 12. Interior and exterior views of a specimen of *P. obtusale* from Marsworth Reservoir. Fig. 9 shows *p. III* curving across *p. I* towards the umbo and ending in a kind of lump or "pseudo-callus." The pseudo-callus is perhaps the easiest way to separate *P. obtusale* from the forms of *P. hibernicum* and other species which at times resemble it.

Figs. 13, 14, 15, 16. Interior and exterior views of a specimen of *P. pulchellum* from a tank at Rickmansworth.

Figs. 17, 18, 19, 20. Interior and exterior views of a specimen from Boveney, Bucks., identified and recorded by Mr. Woodward as "*P. steenbuchii* (Möller)."

Figs. 21, 22. Interior views of a specimen of *P. nitidum* from Marsworth Reservoir.

Figs, 23, 24, 25, 26. Interior and exterior views of a specimen of *P. personatum* (=*P. pusillum* Jenyns) from a ditch by the canal at Wilstone.

Figs. 27, 28. Interior view of the form of *P. casertanum* which is associated with *P. personatum* at Wilstone.

Figs. 29, 30. Interior view of a specimen of *P. casertanum* associated with *P. milium* and other species in Marsworth Reservoir.

DESCRIPTIONS OF A NEW ZEBINA AND A NEW LIOTINA.

By J. R. le B. TOMLIN, M.A.

(Read before the Society, July 17th, 1918).

Plate X.

Zebina [1]**lis** sp. nov. (Plate X., fig. 3).

Very similar in most ways to *Rissoina enteles* M. and S. (*Journ. of Conch.*, viii., p. 307, plate xi., f. 63), but more cylindrical, narrower at the base, and less fusiform; it is also perfectly smooth, lacking the spiral lirations of this species, and has the suture quite flat.

Alt., 6·5 mm.; diam. max., 3 mm.

Hab., Lifu; Oshima, Japan (Hirase, no. 193).

Type from Lifu in my own collection.

Liotina cycloma sp. nov. (Plate X., figs. 1, 2).

Shell solid, subdiscoidal, slightly convex above, white: umbilicus narrow, but open to the apex; whorls 5½ in number, increasing rapidly in size, with a protoconch of 1½ whorls, smooth; the rest of the shell sculptured with very fine, closely packed axial lamellæ; there are six spiral cords—one immediately below the suture, ornamented with a series of numerous sharp-pointed cogs, one on the shoulder of the whorl bearing blunt tubercles, which more or less correspond to the cogs above, two very strong ones on the periphery, one tubercled cord below the periphery, and one cogged cord at the margin of the umbilicus. The peripheral cords are connected at regular intervals of about half-a-millimetre by solid, strongly-raised cross pieces, which are more or less M-shaped if the shell be viewed edgewise and are rather suggestive of the endless chain of buckets on a steam-dredger. The supra-peripheral cord gradually disappears in ascending the spire. Aperture circular, guarded by a strong outstanding varix, on which the spiral cords appear as simple or occasionally bifid ridges.

Alt., 4 mm.; diam. max., 7·5 mm.

Hab., Oshima (Hirase, no. 273).

Type, in my own collection.

◆

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[1] λίς, smooth.

DESCRIPTIONS OF THREE NEW SPECIES OF MARGINELLA FROM SOUTH AFRICA, WITH A NOTE ON M. SUTORIS Dunker.

By J. R. le B. TOMLIN, M.A.

(Read before the Society, July 17th, 1918).

Plate X.

Marginella aphanacme sp. nov. (Plate X., fig. 4).

Shell closely allied to my *M. aphanospira* (*Journ. of Conch.*, xiv., p. 101), but much narrower in breadth, and with a narrower aperture; the columella is more gradually curved towards the base, and carries seven plaits instead of only two, all except the lowest one being small and weak (in the figure nos. 2 to 6 are rather too prominent); labrum slightly thickened and rising above the apex of the whorls anteriorly.

Alt., 2·5 mm.; diam. max., 1·5 mm.

Hab., Port Alfred (Turton).

Type, in coll. Turton.

Marginella [1]ithychila sp. nov. (Plate X., fig. 5).

Shell small, cylindrical, smooth, white; whorls 5½, spire moderate, rather depressed; columella almost straight with numerous plaits, of which the two basal ones are much stronger than the rest; outer lip slightly thickened, very straight and practically parallel to the columella; denticulate and lirate within, the number of denticles being about fifteen; aperture narrow throughout and but slightly widened below; sutures very little marked.

Alt., 2·5 mm.; diam. max., 1·25 mm.

Hab., Pt. Alfred.

Type in coll. Turton.

The figure does not show the denticulation of the lip owing to the slight folding over of the edge. The number of columellar plaits is about six, but it is impossible to determine the exact number in the type owing to a small stone wedged in the aperture.

Marginella [2]atractus sp. nov. (Plate X., fig. 6).

Shell closely related to *M. zeyheri* Krauss, but longer and narrower with a narrower aperture; the number of whorls is the same, but the spire of *M. atractus* is much more produced.

---

[1] ἰθὺς, straight, and χεῖλος, lip.

[2] ἄτρακτος, a spindle.

Alt., 6·5 mm. ; diam. max., 3·25 mm.

Hab., Pt. Alfred.

Type, in my own collection.

The apex of the specimen figured is slightly defective, and I have ot yet seen a perfect example, though the species cannot be very re at Pt. Alfred.

Its specific differences have been recognised for some considerable me, but it has hitherto been passing as *M. fusiformis* Hinds, and is robably so recorded from Port Elizabeth (Crawford) by Smith in roc. Malac. Soc., Lond., v., p. 364 ; and from 49 f. E. of Bird Is., y Sowerby in Marine Invest. S. Africa, ii., p. 227.

The real *fusiformis* Hinds seems to be a rare species ; there is a ngle specimen (the type) in the British Museum, and I have six in y own collection which were dredged by A. Adams in the East, but ear no definite locality. It is a very dissimilar shell from *M. atractus*, eing narrowly fusiform with a small narrow aperture not more than lf the length of the shell, whereas in *M. atractus* the aperture is early $\frac{5}{8}$ths of the total length. Reeve's figure of *M. fusiformis* does ot represent that species, and Jousseaume has founded his *M. unineata* on it.

arginella sutoris Dunker. (Plate X., fig. 7).

I give a figure of what I believe to be an authentic example of the ell distributed by the Godeffroy Museum under this manuscript ame (*cf.* Proc. Malac. Soc., Lond., xii., p. 300). It is obviously the me species as *gibbosa* Jouss., and the locality of "South America" ust be an error.

◆

Neritina fluviatilis at Chester.—The absence of this species from Chester remarked upon by Mr. C. Oldham in his paper on "The Land and Freshwater ollusca of Cheshire" (Naturalist, April, 1896, p. 110). It will be of interest, erefore, to record that I have specimens of the species from the canal at Chester, ken in June, 1917, along with *Vivipara vivipara*.—W. H. DAVIES (*Read before e Society*, June 12th, 1918).

◆

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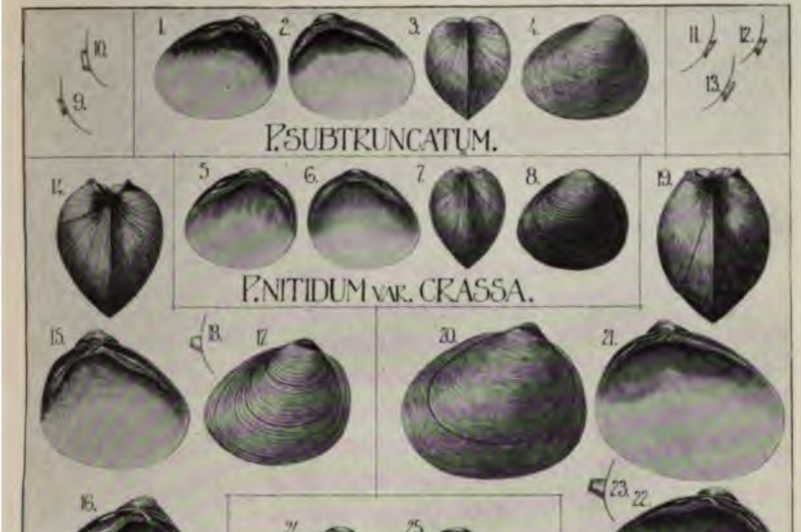

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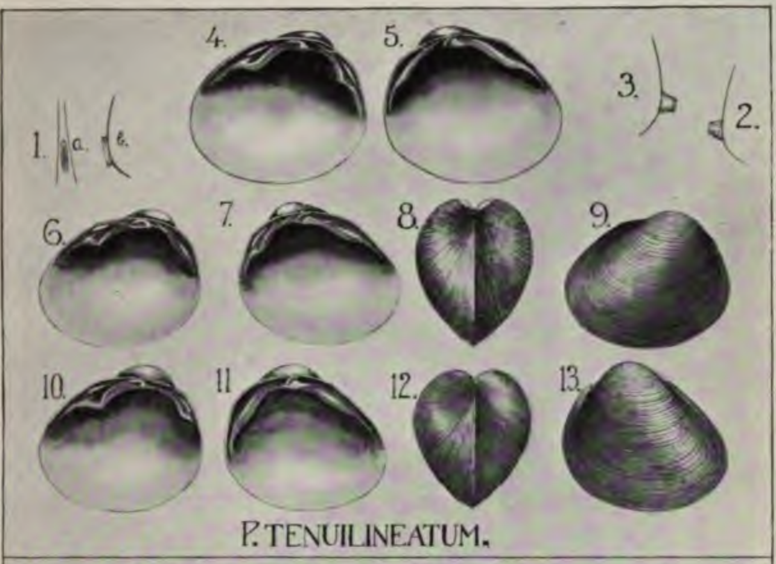

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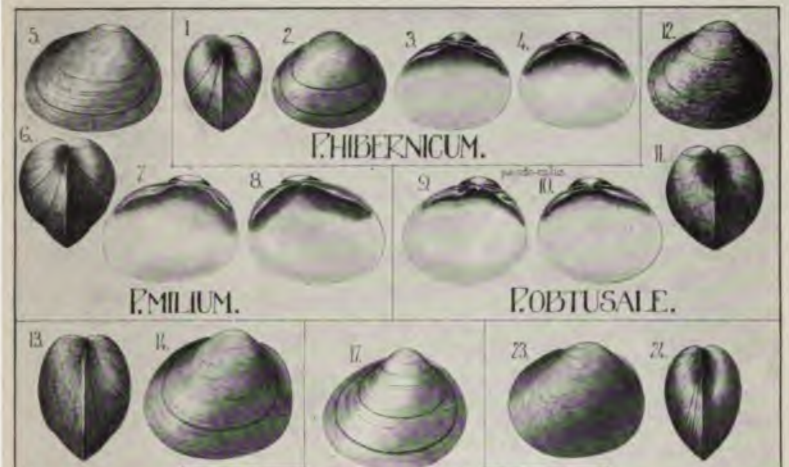

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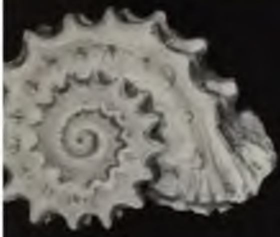

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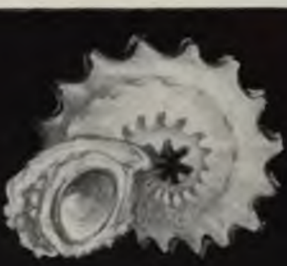

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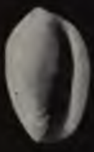

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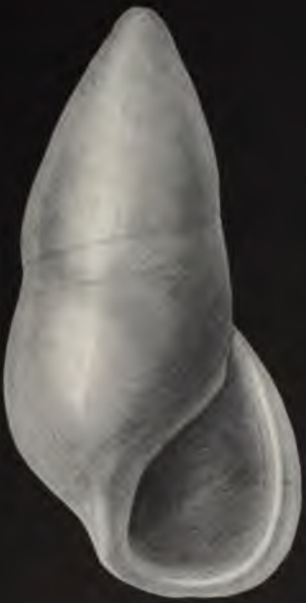

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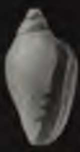

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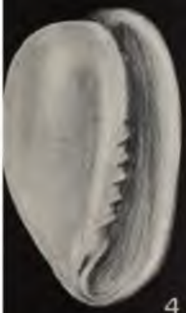

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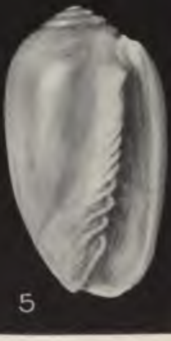

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THE

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CONCHOLOGICAL SOCIETY

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BY

J. R. LE B. TOMLIN, M.A., F.E.S.

VOL. XVI.

1919–1922.

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(Limited to ten in number).

1889. Cossmann, Maurice, 95, Rue de Maubeuge, Paris.
1897. Dall, Wm. Healey, A.M., D.Sc., Smithsonian Institution, Washington, D.C., U.S.A.
1913. Dautzenberg, Ph., 209, Rue de l'Université, Paris.
1897. *P* Godwin-Austen, Lt.-Col. H. H., F.R.S., etc., Nore, Hascombe, Godalming.
1905. Pelseneer, Prof. Paul, 56, Boulevard Léopold, Ghent, Belgium.
1906. Pilsbry, H. A., Academy of Natural Sciences, Philadelphia, Pa., U.S.A.
O *P* Roebuck, W. Denison, M.Sc., F.L.S., 259, Hyde Park Road, Leeds.
1889. Sars, Prof. G. O., Universitet, Christiania, Norway.
1889. Simroth, Dr. Heinrich Rudolph, Kregelstrasse 12, Leipzig-Gautsch.
O *P* Taylor, John W., M.Sc., North Grange, Horsforth, Leeds.

ORDINARY MEMBERS.

1903. Abbott, G., 20, Morley Street, Kettering.
1906. Adams, F. E., Shiel, Sandy Lane Road, Cheltenham.
1917. Adams, John Herbert, Lemain, Looe, Cornwall.
1885. *P* Adams, Lionel Ernest, B.A., Oak Hill, Chart Road, Reigate, Surrey.
1918. Alkins, W. E., B.Sc., Stoneydale, Oakamoor, Stoke-on-Trent.
1911. Allan, Harry, jr., Edina, Parsonage Road, Heaton Moor, Manchester.
1914. Arkell, Lieut. A. J., Royal Air Force, Hinxhill Rectory, Ashford, Kent.
1895. Arnold, Bernard, F.L.S., Milton Lodge, Gravesend.

1908. Bacchus, A. D. R., c/o J. D. Dean, 20, S. Fagan's Road, Ely, Cardiff.
1907. Baily, Joshua L., jr., Haverford, Pa., U.S.A.
1911. Barnard, K. H., B.A., South African Museum, Capetown.
1913. *L* Bartlett, H. F. D., F.E.S., 1, Myrtle Road, Bournemouth.
1918. Bartlett, T. O., Lloyds Bank, Ltd., Westbourne, Bournemouth.
1907. Bartsch, Dr. Paul, Smithsonian Institution, Washington, D.C., U.S.A.
1907. Bavay, A., 82, Rue Lauriston, xvi^e, Paris.
1901. Beeston, Harry, Sunnymead, South Street, Havant, Hants.
1904. Benn, C. A., M.A., F.G.S., Moor Court, near Kington, Herefordshire.
1901. Bentley, R. H., 60, Rosebery Road, Muswell Hill, N. 10.
1897. Blackburn, Rev. E. Percy, Berrister House, Raunds, Northants.
1897. Blake, Wm. Charles, 2, Acacia Villas, Ross, Herefordshire.
1895. Bles, Edward J., M.A., D.Sc., Elterholm, Madingley Road, Cambridge.
1897. Bliss, Joseph, Boar Bank Hall, Grange-over-Sands.
1907. Bloomer, H. H., 40, Bennett's Hill, Birmingham.
1899. Blundell, Mrs. Jessie M., Argyll House, Cirencester.
1910. Booker, H. H., 153, Albert Road, Heeley, Sheffield.
1904. Booth, Fred, 18, Queen's Road, Shipley, Yorks.
1884. Bostock, Edwin D.. F.E.S., Oulton Cross, Stone, Staffordshire.
1906. Boult, J. W., 50, Washington Street, Newland, Hull.
1897. *PL* Boycott, Professor A. E., M.A., D.M., F.R.S., 17, Loom Lane, Radlett.
1900. *L* Broadbent, Dr. G. H., Lynwood, 74, Denton Rd., Audenshaw, Manchester.
1899. Brooksbank, Hugh, M.B., College Road, Windermere.

1905. *L* Bromehead, C. N., Geological Survey and Museum, Jermyn Street, London, S.W. 1.
1911. Brown, Edmund R., 237, Brunswick Street, Manchester.
1913. Bryan, B., 176, Uttoxeter Road, Longton, Staffs.
1897. Burnup, Henry Clifden, Box 182 P.O., Maritzburg, Natal.
1879. Butterell, J. Darker, Manor House, Wansford, Hull.
1902. Button, Fred. L., Bacon Building, Oakland, California, U.S.A.

1906. *L* Carpenter, Geoffrey D. H., B.A., M.B., c/o P.M.O., Entebbe, Uganda.
1913. Carr, Professor G. W., University College Museum, Nottingham.
1918. Carro, Miss Lucia D., Monmouth House, Topsham, R.S.O., Devon.
1903. Cattell, W. Chas., The Poplars, Montagu Street, Kettering.
1918. Cave, Alexander J. E, "Avoca," Hill Lane, Blackley, Manchester.
1915. Challis, Miss B. M., 1210, Brockman Building, Los Angeles, Cal., U.S.A.
1913. * Chalmers, J., c/o The Hon. Secretary.
1889. Christy, Miller, F.L.S., Broom Wood Lodge, Chignal St. James, Chelmsford, Essex.
1904. Clapp, Geo. H., Corner 7th & Bedford Aves., Pittsburgh, Pa., U.S.A.
1913. Clapp, W. F., 25, Ware Street, Cambridge, Mass., U.S.A.
1886. Coates, Henry, F.R.S.E., Corarder, Perth.
1880. *P* Collier, Edwd., Glen Esk, Whalley Range, Manchester.
1898. *PL* Collinge, Walter E., D.Sc., M.Sc. (Birm.), F.L.S., F.E.S., The University, St. Andrews, Scotland.
1913. Connolly, Major M., Ewshot Lodge, near Farnham, Surrey.
1918. Cook, Maurice, 13, Victoria Place, Hartlepool.
1901. Cooke, Rev. Alfred H., M.A., D.Sc., F.Z.S., Aldenham School, Elstree, Herts.
1892. Cooper, James Eddowes, Grangemount, 9, Duke's Avenue, Church End, Finchley, N. 3.
1910. Cribb, Lieut. C. Theodore, Woodhay Lodge, Woolton Hill, Newbury.
1899. Crowther, J. E., Portland Street, Elland, Yorks.

1897. Dacie, John Charles, 30, Montserrat Road, Putney, S.W. 15.
1913. Dalton, E. N., 62, The Avenue, Highams Park, Chingford.
1913. Davey, W. J., 19, Allfarthing Lane, Wandsworth Common, S.W. 18.
1916. Davies, W. H., 22, Pine Grove, Monton, Eccles, Lancs.
1909. Dawes, L., Hambledon, Old Headington, Oxford.
1915. Day, Henry, M.Sc., Clifton Terrace, Hayfield Road, Chapel-en-le-Frith.
1915. Deakin, Percy T., c/o J. W. Moore, 151, Middleton Hall Road, King's Norton, Birmingham.
1898. Dean, J. Davy, 20, S. Fagan's Road, Ely, Cardiff.
1916. Despott, Giuseppe, Valletta University, Malta.
1909. Dickson, Robert Cecil, M.B., Ch.B., 29, Strathmartine Road, Dundee.
1909. *L* Diver, Capt. Cyril, c/o Col. T. Diver, Tal-an-Veer, Lilliput, Parkstone, Dorset.
1916. Doello-Jurado, Professor M., Museo Nacional de Historia Natural, Peru, 208, Buenos Aires.
1910. Dyke, F. M., B.Sc. (Lond.), Nelson Croft, 29, Church Road, Lower Bebington, Cheshire.

1895. Edwards, Thos., 247, Narborough Road, Leicester.
1901. Edwards, W. H., Hastings Museum, Victoria Institute, Worcester.
1891. Elgar, Hubert, Museum and Public Library, Maidstone.

1904. *L* Eliot, Sir Chas., K.C.M.G., Vice-Chancellor, University, Hongkong.
1884. Elliot, Edward J., High Street, Stroud, Gloucestershire.
1910. Elliott, W. T., D.D.S., F.Z.S., Arden Grange, Tamworth-in-Arden, Worcs.
1913. Emmett, H., 156, Moston Street, Hanley, Staffs.
1894. Evans, Wm., F.R.S.E., 38, Morningside Park, Edinburgh.

1918. Falcon, W., M.A. (Cantab.), Hilton College, Hilton Road, Natal.
1897. *L* Farquhar, John, 3, Rose Terrace, African Str., Grahamstown, Cape Colony.
1891. Farrer, Captain Wm. James, 1, Courtney Road, Southport.
1897. Fielding, Clement, M.P.S., Clover Hill, Halifax, Yorks.
1915. Firth, J. Digby, F.L.S., F.E.S., Boys' Modern School, Leeds.
1884. *L* Fitzgerald, Rev. H. Purefoy, F.L.S., Lidwells, Goudhurst, Kent.
1912. *L* Frames, P. R., P.O. Box 148, Johannesburg, S. Africa.
1905. Freeman, William, Hawkhurst, Milton Road, Oundle.
1892. Fulton, Hugh, 27, Shaftesbury Road, Hammersmith, London, W. 6.
1913. Fysher, Greevz, 78, Chapel Allerton Terrace, Leeds.

1907. *L* Gabriel, Charles J., 297, Victoria Street, Abbotsford, Victoria, Australia.
1914. Gardiner, Alan, B.Sc., The Bridge House, Bradfield College, Reading.
1913. Gauntlett, H. L., M.R.C.S., L.R.C.P., A.K.C., 39, Oakhill Road, Putney, S.W. 15.
1917. Giffard, H. P. W., B.A., B.Sc., F.G.S., 103, Ebury St., London, S.W. 1.
1908. Gill, Mrs. A. E., Dinant Cottage, 1, Claude Road, Chorlton-cum-Hardy.
1916. *L* Gladstone, John S., Nanhurst, Cranleigh, Surrey.
1886. *L* Godlee, Theo., Whips Cross, Walthamstow, Essex.
1904. Gray, Arthur F., Exchange Building, 53, State St., Boston, Mass., U.S.A.
1904. Grierson, P. H., St. Kevins, Bray, co. Wicklow.
1890. Gude, G. K., F.Z.S., 9, Wimbledon Park Road, S.W. 18.
1907. Gyngell, Walter, 13, Gladstone Road, Scarborough.

1909. Haas, Dr. Fritz, Museo Martorell, Barcelona, Spain.
1910. Hadden, Norman G., Breezy Bank, West Porlock, Somerset.
1895. Hann, Rev. Adam, 20, Canute Road, Stretford, Manchester.
1895. Hardy, John Ray, 27, Griffin Grove, Levenshulme, Manchester.
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1887. Heathcote, Wm. Henry, F.L.S., The Marsh, Longton, Preston, Lancs.
1907. Henderson, J. B., jr., 16th Street and Florida Avenue, Washington, D.C., U.S.A.
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1887. Hey, Thomas, 98, Archer Road, Millhouses, Sheffield.
1895. Hibbert, Charles R. C., South Close, Landcross, Bideford, Devon.
1895. *P* Hickson, Prof. Sydney J., D.Sc., M.A., F.R.S., University, Manchester.
1918. Hill, John, 8, Stanley Street, Leek, Staffs.
1886. *L* Hillman, Thomas Stanton, Eastgate Street, Lewes, Sussex.
1907. Hindley, R. T., Hawthorn Cottage, Buxton Old Road, Macclesfield.
1906. Hirase, Y., Karasumaru, Kyoto, Japan.
1911. Hitchon, Mrs. Susan A., Rhyddington, Oswaldtwistle, Lancs.
1891. *P* Horsley, Rev. Canon J. W., M.A., Detling Vicarage, Maidstone.

1917. Horton-Smith, Dr. W., M.B., Ravenswood, Winnington, Northwich.
1907. Horwood, A. R., Leicester Museum and Art Galleries, Leicester.
1907. Howard, Vernon, Carlton Lodge, Eastgate, Louth.
1884. Howell, George O., 210, Eglinton Road, Plumstead, Kent.
1892. Howorth, Sir Henry Hoyle, K.C.I.E., M.P., F.R.S., etc., 45, Lexh Gardens, London, W. 8.
1886. *P* Hoyle, W. E., M.A., D.Sc., The National Museum of Wales, Cardiff.
1909. Huggins, Henry C., 17, Clarence Place, Gravesend.
1915. Hurst, C. P., Ivy House, Great Bedwyn, Hungerford.
1905. Hutton, W. Harrison, 44, Dial Street, Leeds.

1913. * Ingrams, Lieut. W. H., 7th The King's Shropshire Light Infantry, G.P.O., London.

1901. Jackson, J. Wilfrid, F.G.S., The Museum, The University, Manchester
1912. Jenkinson, Charles, Cliffe House, London Road, Kettering.
1891. Jenner, James Herbert Augustus, F.E.S., Eastgate House, Lewes.
1912. *L* Jewell, Miss F., Emsworth, Hants.
1906. Johnson. Chas. W., Boston Society of Natural History, Boston, Ma U.S.A.
1894. Jones, Fleet-Surgeon K. H., M.B., Ch.B., F.Z.S., R.N., The Ma House, St. Stephen's, Canterbury.

1907. Kendall, Rev. C. E. Y., Oundle, Northants.
1897. *L* Kennard, A. S., Benenden, 161, Mackenzie Road, Beckenham, Kent.
1914. Kennedy, Lieut. J. Noble, M.C., Headquarters, 1st Anzac Heavy Artill B.E.F., France.
1902. *L* Kensett, Percy F., Broadmeadow, Coombe Lane, Wimbledon, S.W. 19.
1897. Kenyon, Mrs. Agnes Fleming, 291, Highett St., Richmond, Melbour Victoria.
1917. Keogh, Duncan, 13, Richmond Wood Road, Bournemouth.
1917. Kitchen, J. G., 19, Byrom Street, Altrincham, Cheshire.
1889. Knight, Rev. G. A. Frank, M.A., F.R.S.E., 52, Sardinia Terrace, Hillhe Glasgow.

1901. Laidlaw, Dr. F. F., M.A., Hyefield, Uffculme, Cullompton, Devon.
1899. Lancaster, Ernest Le Cronier, B.A., M.B., Winchester House, Swans
1917. Langmead, L. B., Uplands, Honor Oak Road, Forest Hill, S.E. 23.
1918. Laverack, Clyve C., Ph.C., M.P.S., Broughton Rise, Malton.
1894. *L* Lawson, Peter, Jesmond, 13, Nella Road, Fulham Palace Road, Hamm smith, W. 6.
1911. Leman, George C., Wynyard, 152, West Hill, Putney, S.W. 15.
1910. Levett, Rev. T. T., F.Z.S., Frenchgate, Richmond, Yorks.
1899. Lightfoot, Robert M., South African Museum, Cape Town.
1909. Linton, Mrs., Ye Olde Mill House, Castle Hill, Northallerton.
1908. Longstaff, Mrs. G. B., F.L.S., Highlands, Putney Heath, S.W. 15.
1898. Lucas, B. R., F.G.S., Winnington Park, Northwich, Cheshire.
1910. * Lucas, F. R. Tindall, Tewin Vale, Welwyn.
1891. Lyons, Lady, Venaway, Parkmill, R.S.O., Glamorganshire.

1911. MacLeod, D. J., Hof Ter Meere, 13, Reigerstraat, Ghent, Belgium.
1917. *L* Marle, Rev. Robert, M.A., Cross Stone Vicarage, Todmorden, Yorks.
1887. Marshall, J. T., 35, Aquila Road, S. Heliers, Jersey.
1915. Martin, George A., Highdene, St. Nicholas, near Cardiff.

1887. *P* Masefield, John R. B., M.A., Rosehill, Cheadle, Staffordshire.
1904. Massy, Miss A. L., Tredagh, Malahide, co. Dublin.
1889. Mayfield, Arthur, Mendlesham, Stowmarket, Suffolk.
1914. Mazyck, W. G., Hon. Curator, Charleston Museum, S. Carolina, U.S.A.
1903. McClelland, Hugh, The Manor House, Berkswell, near Coventry.
1880. *P* Melvill, James Cosmo, M.A., D.Sc., F.L.S., Meole Brace Hall, Shrewsbury.
1904. Milne, James N., Westbank, Partickhill, Glasgow.
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1902. *L* Moore, Chas. H., 103, Mottram Road, Stalybridge.
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1917. Morley, John, A.M.I.Inst.E., 2, Clarence Villas, Ashburton Road, Trafford Park, Manchester.
1918. Mückardt, Harald, Drottuinggatan, 11, Helsingborg, Sweden.
1912. Murdoch, G. H., 49, Parliament Hill, Hampstead, N.W. 3.
1907. Musham, J. F., F.E.S., Haylands, Brook Street, Selby, Yorks.

1905. Napier, H. C., Elms Lodge, 39, Kingston Lane, Teddington.
1911. Nash, Rev. E. H., M.A., Wetley Rocks Vicarage, Stoke-on-Trent.
1918. Nelson, Geo., 38, Griffiths Street, Falkirk, Stirlingshire.
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1891. *P* Newton, Richard Bullen, F.G.S., 11, Twyford Crescent, Acton Hill, W. 3.
1915. Norwood, Mrs. Gilbert, 4, The Glen, Saundersfoot, Pembrokeshire.

1887. *L* Oldham, Chas., F.L.S., F.Z.S., The Bollin, Shrublands Rd., Berkhamsted.
1910. Oliver, A. M., Thorney Close, Fenham, Newcastle-on-Tyne.
1896. *L* Overton, Harry, The Newlands, Boswell Road, Sutton Coldfield.
1905. *L* Owston, Alan, Yokohama, Japan.

1904. Parritt, H. W., 14, Stanhope Gardens, Highgate, N.
1886. Pearce, Rev. S. Spencer, M.A., Long Combe Vicarage, near Woodstock, Oxfordshire.
1913. Pellow, N. E., 319, Stratford Road, Sparkbrook, Birmingham.
1918. Perry, Edmund E., 6, Stuart Crescent, Wood Green, London, N. 22.
1907. Petty, S. L., Dykelands, Ulverston, Lancs.
1908. Phillips, R. A., Ashburton, Cork.
1897. Preston, Hugh B., F.Z.S., Hostellerie du Dauphin, A.E.F., Y.M.C.A., Vannes, Morbihan, France.
1907. Priske, R. A. R., 9, Melbourne Avenue, West Ealing, Middlesex.
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1913. Rhodes, F., 113, Heaton Road, Manningham, Bradford, Yorks.
1900. Richards, C. P., Mission House, Stenalees, St. Austell, Cornwall.
1898. Roberts, A. William Rymer, Rothamsted Experimental Station, Harpenden, Herts.
1918. Robins, E. A., Swinton Lodge, Essex Road, Watford.

O *P* Roebuck, W. Denison, M.Sc., F.L.S., 259, Hyde Park Road, Leeds.
1901. * Rooth, J. A., M.R.C.S., 6, Richmond Terrace, Brighton.
1893. Roseburgh, John, Market Square, Galashiels, Roxburgh.
1910. *L* Rowe, A. W., M.S., M.B., M.A.C.S., F.G.S., Shottendane, Margate.

1914. Saban, Alfred J., 71, Surrey Road, Peckham Rye, S.E. 15.
1906. Salisbury, Albert E., 12a, The Park, Ealing, W. 5.
1877. *P* Scharff, Robert F., Ph.D., M.R.I.A., Knockranny, Bray, co. Wicklow.
1906. Schepman, M. M., Bosch en Duin, Huister Heide, Utrecht, Holland.
1895. *L* Schill, C. H., Crosten Towers, Alderley Edge.
1918. Schlesch, Hans, c/o Nyt Apotek, Nestved, Denmark.
1910. *L* Shaw, H. O. N., B.Sc., F.Z.S., 112 & 114, Wardour Street, London, W. 1.
1904. Shaw, Rev. W. A., Peper Harow Rectory, Godalming.
1906. Shopland, Commander E. R., Cecilia House, The Avenue, Lowestoft.
1910. Shrubsole, George, Elm Bank, Workington, Cumberland.
1895. Sich, Alfred, F.E.S., Corney House, Chiswick, W. 4.
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1894. Smith, Wm. Chas., 92, Dawes Road, Fulham, S.W. 6.
1918. Soames, Rev. H. A., M.A., F.Z.S., Hazelcroft, Mason's Hill, Bromley, Kent.
1900. Solly, E. H., Lea Orchard, Ottinge, Elham, near Canterbury.
1917. Sowden Harry, Hon. Recorder, York and District Field Naturalists, Micklegate Bar, York.
1886. Sowerby, Geo. Brettingham, F.L.S., 26, Ennerdale Rd., Richmond, Surrey.
1907. Spence, G. C., 10, Pine Grove, Monton, Eccles, Lancs.
1914. Stainton, Ernest, 70, Jubilee Road, Doncaster.
1906. Stalley, Henry J., Thorntona, Oxted, Surrey.
1886. *P* Standen, Robert, The Museum, The University, Manchester.
1911. * Standish, C. M., Prospect House, Weldbank, Chorley.
1915. Steenberg, C. M., Mag. Sc., Royal Observatory, Ostervoldgade, 3, Copenhagen.
1903. *L* Stelfox, A. W., M.R.I.A., Ballymagee, Bangor, co. Down.
1918. Stephens, G. A., F.L.A., City Librarian, The Public Library, Norwich.
1910. Stephenson, H. L., 90, Tempest Road, Beeston Hill, Leeds.
1908. *L* Stobart, H. J. S., Belbroughton, Stourbridge.
1897. Stracey, Bernard, M.B., 26, De Montfort Street, Leicester.
1890. Stubbs, Arthur Goodwin, The Meads Cottage, Hailey Lane, Hertford.
1893. Stump, Edward C., Balgownie, Rochdale Road, Blackley, Manchester.
1895. Swanton, E. W., The Educational Museum, Haslemere, Surrey.
1888. *P* Sykes, Ernest Ruthven, B.A., F.L.S., Longthorns, Blandford.

1910. Tattersall, W. M., D.Sc., The Museum, The University, Manchester.
1895. Taylor, Fred, 42, Landseer Street, Park Road, Oldham, Lancs.
1907. Taylor, G. H., School House, Higher Blackley, Manchester.
1904. *L* * Taylor, Gerald Medland, Rossall School, Fleetwood.
1907. Taylor, J. Kidson, 45, South Avenue, Buxton.
1903. Thaanum, D., 5, Church Street, Hilo, Hawaiian Islands.
1907. *L* Thornton, H. G., Kingsthorpe Hall, Northampton.
1886. *L* Tomlin, J. R. le B., M.A., F.E.S., 120, Hamilton Road, Reading.
1906. Turton, Lt.-Col. W. H., D.S.O., R.E., 30, Caledonia Place, Clifton, Bristol.

1907. Upton, Charles, Rooksmoor, Tuffley Avenue, Gloucester.

1914. Van der Sleen, Dr. W. G. N., Stoofsteeg, 1, Haarlem, Holland.
1915. Van Hyning, T., Curator, Florida State Museum, Gainesville, Fla., U.S.A.
1899. Vaughan, J. Williams, J.P., Pen-y-maes, Hay, *via* Hereford.
1897. Vignal, Louis, 28, Avenue Duquesne, Paris.
1902. Vincent, W. C. W., 39, West Bank, Stamford Hill, N. 16.

1898. Wakefield, H. Rowland, 7, Montpelier Terrace, Swansea.
1891. Walker, Bryant, 1306, Dime Bank Building, Detroit, Michigan, U.S.A.
1917. Wallace, Henry Simpson, F.E.S., 6, Kayll Villas, Sunderland.
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1916. Whitwell, John W., 39, Queen's Way, Wallasey.
1886. Whitwell, Wm., Brookside, Darley Green, Knowle, Warwickshire.
1911. * Williams, James M. M., Imperial House, Pontlottyn, Cardiff.
1889. Williams, John M., 31, Grove Park, Liverpool.
1915. Wilman, Miss M., McGregor Memorial Museum, Kimberley, South Africa.
1913. Winckworth, Ronald, 37, Upper Rock Gardens, Brighton.
1917. *L* Wintle, Wm. James, F.Z.S., 96, Barrowgate Road, Chiswick, W. 4.
1901. *L* Woodruffe-Peacock, Rev. E. A., F.L.S., etc., Cadney, Brigg, Lincs.
1898. Woods, Henry, M.A., F.G.S., Sedgwick Museum, Cambridge.
1886. *L* Woodward, Bernard B., F.L.S., etc., 4, Longfield Rd., W. 5.
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1895. Wright, Charles East, Neale Avenue, Kettering.

◆

A New Variety of Arion ater.—I have had a rich collection of slugs from Church Stretton, in Shropshire, collected 16th Sept., 1918, by Mr. G. B. C. Leman. It included *Limax maximus* vars. *concolor*, *fasciata*, and *cellaria*, *Limax arborum*, *Milax sowerbyi*, *M. gagates*, *Agriolimax agrestis* var. *reticulata*, *Arion circumscriptus*, *A. intermedius*, type and var. *grisea*, *A. subfuscus* vars. *rufofusca* and *fuliginea*, and *A. ater*, type and vars. *castanea*, *nigrescens*, *castanea* + *fasciata*, and a couple of adult specimens of a variety which I have never seen before. It is of the *bicolor* and *albolateralis* group, having the colour of the back sharply and definitely separated from that of the sides, but is not referable to either of these varieties. In the interest of precision I venture to characterize it as new, thus:—"*Arion ater* var. *salmolateralis* nov.—Back black, sides pale warm orange in colour, the colours sharply separated from each other." In this example, one of the most brilliantly coloured examples I have ever seen of the species, the foot-fringe is brilliant orange. I have sent the type specimen to the British Museum for permanent preservation.—W. DENISON ROEBUCK (*Read before the Society*, Oct. 12th, 1918).

much use; if you can conveniently get more than 100 so much the better. For some purposes thousands may be desirable, but they are seldom practicable, and the advance in precision by substituting 1,000 specimens for 100 is the same as by taking 100 instead of 10.

(2). The collection and measurement having been achieved, the question of interpretation arises. If nine specimens of ***bidentata*** from locus A measure in length 10·0, 10·1......10·8 m.m., the average length is 10·4 m.m.; if nine specimens from locus B measure 10·1, 10·2......10·9 m.m., the average is 10·5 m.m. It is natural to conclude that *bidentata* from locus B is longer than from locus A, but since the size is so variable and the whole snail population of each locus much larger than the sample which has been examined, it is a fairly open possibility that a second sample of nine from locus A might give the same measurements as those from locus B, and vice-versa. The question as to whether the species differs in size in the two loci is really one of the probability of our samples being really representative of the two populations; for its solution we have to proceed by statistical methods of numerical analysis.[1] In a case such as the present, the recognised procedure is as follows, using the examples already imagined. For locus A take the mean length = 10·4 m.m.; for each specimen take the difference (it does not matter whether it is in excess or in defect) between its length and the mean, i.e., 0·4, 0·3, 0·2, 0·1, 0·0, 0·1, 0·2, 0·3, 0·4; square the differences, i.e., 0·16, 0·09, 0·04, 0·01, 0·01, 0·04, 0·09, 0·16; divide the sum of the squares by the number of specimens, i.e., $\frac{0{\cdot}60}{9} = 0{\cdot}0667$; take the square root of the quotient, i.e., 0·258 m.m., which is the ***standard deviation*** (shortly σ). The ***standard error of the mean*** is the standard deviation divided by the square root of the number of observations, i.e., $\frac{0{\cdot}258}{3} = 0{\cdot}086$ m.m. For locus B the mean is 10·5, its standard error and the standard deviation being the same as for locus A. Take the square root of the sum of the squares of the standard errors of the two means, i.e. $(0{\cdot}0074 + 0{\cdot}0074)^{0{\cdot}5} = 0{\cdot}122$ m.m., which is the ***standard error of the difference***. The difference between the two means must be at least three times the standard error of the difference to be regarded as "significant." If it is less, there is quite a good chance that we are merely dealing with two samples of the same variable population; if it is more, it is tolerably certain that the populations from which our samples have been collected are really different in size. In the present instance, the difference between the means is 0·1 m.m., i.e., only 0·8 times the standard error, and we conclude that this is not significant, i.e., there is no evidence that the snail communities from which the samples were taken differ in length. Two samples from A or B might easily have given means differing by 0·1 m.m. Suppose a third sample from locus C had consisted of nine specimens measuring 10·4, 10·5......11·3, mean 10·8: then the difference A/C would have been 0·4 m.m., which is $\frac{0.4}{0\cdot122} = 3\cdot3$ times its standard error and significant, and we should judge that the population in locus C did really differ from that in locus A; C would not, however, be significantly different from the sample from locus B, as the difference would be only $\frac{0\cdot3}{0\cdot122} = 2\cdot5$ times its standard error.

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[1] For an account of this important subject of more than ordinary clarity, see G. U. Yule, *Introduction to the Theory of Statistics* (Griffin & Co.), a book to which biologists of all sorts ought to be deeply indebted. The particular topics dealt with here will be found in chapters vi.—viii. and xiii.

This curious series, A different from C, A not different from B, B not different from C, emphasizes a point of importance. A significant difference means a difference; a non-significant difference does not mean identity, but only that on the evidence we have we cannot conclude that there is a difference. The influence of the number of specimens examined on the standard error of the difference points this still more clearly, and, as I take it, it would be impossible to demonstrate identity of size unless we could measure with infinite accuracy the whole community under examination. The conclusion, therefore, that " M is not different from N," is not the same as that " M is the same as N," though for many practical purposes we look on them as interchangeable.

Why these things should be so, I do not pretend to understand. It is evident that making three times the standard error of the difference the limiting value is fixing an arbitrary limit, and it will occasionally happen that significant differences will be found between samples collected from the same population, just as non-significant differences may be determined for lots of shells taken from communities known to differ in the size of the individuals which compose them. But the rule seems to work very well in practice, and some of the material collected at Portmadoc enables us to put this particular pudding to what will appeal as the soundest test to those of a pragmatical turn of mind.

Thus from one locus (A) I have five fairly large collections, the germane particulars of the length of which are—

	Date.	Number.	Mean.	Standard deviation.
α	Aug., 1913	204	11·356	0·741
β	31/7/14	209	11·490	0·804
γ	23/8/14	296	11·407	0·707
δ	29/8/14	75	11·393	0·672
ϵ	30/8/14	132	11·450	0·760

The largest difference is α/β = 0·134 m.m., which is less than twice its standard error, the others are still less significant; evidently therefore, there is no demonstrable difference between the five samples.

From another locus (H) there are three collections—

	Date.	Number.	Mean length.	Standard deviation.
α	2/8/14	100	11·478	0·642
β	23/8/14	306	11·485	0·652
γ	28/8/14	57	11·400	0·700

The largest difference is β/γ = 0·085, 0·8 times its standard error.

From a third locus (B) there are two lots—

	Date.	Number.	Mean length.	Standard deviation.
α	23/8/14	66	11·223	0·726
β	28/8/14	86	10·991	0·602

The difference is 0·232 m.m., its standard error 0·110.

From a fourth locus (C) there are also two lots—

	Date.	Number.	Mean length.	Standard deviation.
α	9/8/14	79	10·162	0·692
β	27/8/14	44	10·382	0·747

The difference here is only 1·6 times the standard error.

It occasionally happens that samples derived, as far as may be, from the same locus, show significant differences. Thus one of the collections (γ) from locus A was actually made in eight small lots, which gave the following results when treated as separate samples—

	Number.	Mean.	Standard deviation.
1	31	11·200	0·578
2	51	11·129	0·629
3	27	11·504	0·791
4	31	11·584	0·689
5	47	11·606	0·637
6	31	11·494	0·693
7	41	11·317	0·634
8	37	11·519	0·651

The largest difference is 2/5 = 0·477 m.m., which is 3·7 times its standard error; the next largest is 2/4 = 0·455 m.m, which is 3·0 times its standard error; the next biggest difference 1/5 = 0·406 m.m., which is 2·9 times its standard error; the other differences are all much less than three times. Out of 28 possible comparisons therefore, two are significantly different,[1] the rest negative.

Similarly β from locus H was collected in six batches—

	Number.	Mean length.	Standard deviation.
1	54	11·504	0·591
2	59	11·566	0·812
3	42	11·352	0·502
4	59	11·483	0·631
5	39	11·351	0·613
6	53	11·581	0·603

The evident difference is $5/6 = 0·230$ m.m., which is only 1·7 times its standard error; in none of the fifteen possible comparisons is there any significant difference.

It is evident, therefore, that samples of snails collected from the same locus will nearly always work out as "not different" by this method of examination. I have dwelt at some length on the evidence for this, as it is evidently a fundamental point on which the validity of this method of enquiry largely depends. That samples collected in different loci frequently give significant differences, the sequel shows fully enough.

With these preliminary considerations, we may proceed to the examination of our immediate problem. Measured collections are available from ten different loci in the neighbourhood of Portmadoc; do the shells from these different places differ in size?

The topographical relations of the loci are shown on the sketch map, which indicates also the 500 feet contour. Their individual characteristics cannot be satisfactorily described in detail, but the leading features of similarity and difference may be shortly summarised. All were stone walls of the local slaty rock, and all were at a low altitude, E to J practically at sea-level, A and B about 100 feet, C and D about 200 feet. A: about 90 yards long, both sides[2] of a narrow rather shaded lane with metalled surface. B: roadside wall, open, about 50 yards. C: the abutment of an old tramroad bridge, about ten yards, open. D: similar, rather more shaded. E: a ruined house, deeply shaded. F: roadside wall, moderately shaded, 40 yards. G: an old shed in a wood, deeply shaded. H, I, and J: roadside walls, each about 20 yards long, H much shaded, the other two open. All the loci would be fairly called sheltered, except B, which was pretty fully exposed to the west, and C and D which are draughty loci on higher ground towards the pass leading westwards from the Glaslyn Valley. A, B, F, H, I, and J one would call loci of highly similar characteristics; E and G similarly go together.

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[1] The eight samples were collected successively along about 80 yards of wall. There is every possibility that the area I have regarded as locus A is not homogeneous, and indeed if one accepts the statistical test in its entirety the results prove this rather than an occasional failure of the test. Theoretically, however, the test is relative rather than absolute, and, pending further more systematic observations made with the point specially in view, I should regard the meaning of these exceptions as doubtful. Testing by another method by which each sample is compared to the seven others taken together, 2 alone is significantly different.

[2] Samples taken separately on the two sides gave the answer "not different," but it was certainly an error of judgment to take both sides as forming one locus; a metalled road cannot be very permeable to *bidentata*.

The required data are set out in table I. The shells being measured to 0·1 m.m., it is impossible to give the full details for altitude, and these have accordingly been set out in groups covering 0·5 m.m.; this is the less objectionable as in practice it is convenient to make the necessary calculations from such grouped data rather than from the individual measurements[1]; the diameter is much less variable and can be given in full. The other data are the maximum and minimum (to show the extreme range), the mean, the standard deviation and the number of specimens measured.

The longest shells are H, the shortest E. The difference between E/H is 1·302 m.m., between any other pair less until it dwindles to 0·007 m.m. for A/I. It would almost stand to reason—or common sense—that this latter difference can mean very little and that the former may mean much. But whether it really means anything and what we are to think of all the intermediate values cannot be determined by inspection and a hope of revelation; the answers can be obtained only by proceeding along some such method of evaluation as has been outlined above.

Applying this method to the figures in table I we get the results shown in tables II to V. Table II gives the absolute difference in millimetres between each possible pair, table III the standard error of the differences in each case, and table IV the figures obtained by dividing each difference by its standard error; in each table the right upper half refers to altitudes, the left lower half to diameters. The results are summed up in table V, which shows the comparisons which give significantly different results for altitude and diameter respectively.

There are 45 possible pairs for comparison from the ten loci. In altitude 30 show differences which are real according to the rule, in diameter 19; in 12 cases the samples differ from one another in both diameter and altitude, while in 7 they differ in diameter but not in altitude, and in 18 in altitude but not in diameter. In all, therefore, there are 37 differences out of a possible 45. C, E, G and H each differ from all the other samples in altitude or diameter or both, and F alone shows fewer differences than not; A, B, D, I and J differ from the majority of other samples, but each is not signifi-

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[1] See the methods given in Yule, op. cit., pp. 112, 141.

TABLE I.

		ALTITUDE.																DIAMETER.											
Locus.	Number examined	8·0–8·4 m.m.	8·5–8·9 m.m.	9·0–9·4 m.m.	9·5–9·9 m.m.	10·0–10·4 m.m.	10·5–10·9 m.m.	11·0–11·4 m.m.	11·5–11·9 m.m.	12·0–12·4 m.m.	12·5–12·9 m.m.	13·0–13·4 m.m.	13·5–13·9 m.m.	Maximum.	Minimum.	Mean.	Standard deviation (σ)	2·2 m.m.	2·3 m.m.	2·4 m.m.	2·5 m.m.	2·6 m.m.	2·7 m.m.	2·8 m.m.	2·9 m.m.	3·0 m.m.	3·1 m.m.	Mean.	Standard deviation (σ)
A	712	...	...	...	8	41	129	213	167	86	43	21	4	13·7	9·7	11·436	0·735	...	5	62	173	323	123	26	...	...	...	2·581	0·097
B	152	...	...	1	6	14	48	35	34	11	3	...	...	12·8	9·3	11·091	0·668	...	6	14	46	59	24	3	...	...	...	2·559	0·105
C	123	...	2	15	28	34	27	7	8	2	...	...	...	12·2	8·8	10·241	0·732	1	17	35	45	24	1	...	...	...	...	2·463	0·100
D	77	...	1	1	3	13	17	20	13	7	1	1	...	13·2	8·7	11·024	0·794	...	...	6	26	32	13	...	...	...	...	2·568	0·084
E	173	1	4	19	46	45	35	17	6	...	...	...	...	11·8	8·3	10·171	0·690	...	2	10	45	77	36	3	...	...	...	2·584	0·092
F	71	...	...	...	3	9	12	17	19	9	2	...	...	12·6	9·5	11·228	0·720	...	2	5	15	33	11	5	...	..	...	2·559	0·108
G	144	...	...	8	31	30	37	25	10	3	..	...	...	12·1	9·1	10·489	0·711	...	4	20	35	54	28	3	...	...	...	2·565	0·109
H	463	...	...	...	5	13	79	136	127	73	20	10	...	13·4	9·6	11·473	0·656	...	1	23	76	203	122	33	4	...	1	2·617	0·101
I	94	...	...	...	2	7	16	21	28	11	7	2	...	13·3	9·6	11·429	0·745	...	4	9	32	43	6	...	...	...	...	2·540	0·090
J	189	...	...	...	2	12	42	49	45	20	16	2	1	13·5	9·6	11·348	0·731	...	3	14	59	85	24	3	1	...	...	2·566	0·091
Total	2198	1	7	44	134	218	442	540	457	222	92	36	5	13·7	8·3	11·166	0·846	1	44	198	552	933	388	76	5	0	1	2·576	0·104

cantly different from one or more of the others.[1]

How far the nonsignificant might be transformed into significant differences by examining a larger number of specimens is a matter of speculation. It is obvious from the method that the number does make a difference, and the present data supply an illustration. From six of the ten loci shells were collected in more than one lot. Taking the first samples from these six, and the only samples from the other four loci, the number examined in no case exceeds 100, and in all there are 723 instead of 2198. The differences in altitude found to be significant are 25 instead of 30 in the full series. As has been indicated already, the gain in precision is proportional only to the square root of the number examined, and after a time will be a disappointing return for the labour involved.

It is perhaps interesting also to note the result of altering our criterion of difference. If we ask that the absolute difference shall be only twice its standard error, we have 34 significant differences in altitude and 23 in diameter instead of 30 and 19 with the standard three ttmes. If we raise the limit to four times the figures become 26 and 17.

Assuming that further specimens from any locus would have shown the same dimensions as these actually measured, one may of course calculate how many it would be necessary to measure to make any observed difference significant. Such an assumption is, however, unjustifiable, and I raise the point mainly to indicate that it does not necessarily follow that the specimens from every locus would differ from those of every other locus if only a sufficient number were examined. From the present data it seems likely that differences would predominate, but not more than that. The numbers necessary would at any rate remove the question from the sphere of practical conchology.[2]

There are a number of other interesting problems in the measurement of these *C. bidentata*—the variability, the relation between altitude and diameter, etc.—which cannot be dealt with now. Our original question has, however, been answered to the effect that the shells from each of the ten loci considered do generally differ in size from those from the other nine loci in the same neighbourhood. The differences, too, are such as are easily demonstrable by appro-

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[1] One may also examine the question by testing (see *Biometrika*, vol. v (1906), pp. 181, 316) how far the specimens from one locus differ from the specimens from all ten loci taken together. The result obtained is that A, C, E, G, H, I and J differ in altitude and C, H, and I in diameter. The method does not seem to me so suitable for the present enquiry as the one adopted above.

[2] For average *C. bidentata*, to establish a difference of 0·1 m m. in mean altitude as significant would require about 1,000 specimens in each sample; a difference of 0·01 m.m. about 100,000.

TABLE II.

DIFFERENCES IN MILLIMETRES.

	A	B	C	D	E	F	G	H	I	J
A		0·345	1·195	0·412	1·265	0·208	0·947	0·037	0·007	0·08
B	0·022		0·850	0·067	0·920	0·137	0·602	0·382	0·338	0·25
C	0·118	0·096		0·783	0·070	0·987	0·248	1·232	1·188	1·10
D	0·013	0·009	0·105		0·853	0·204	0·535	0·449	0·405	0·32
E	0·003	0·025	0·121	0·016		1·057	0·318	1·302	1·258	1·17
F	0·022	0·000	0·096	0·009	0·025		0·739	0·245	1·201	0·12
G	0·016	0·006	0·102	0·003	0·019	0·006		0·984	0·940	0·85
H	0·036	0·058	0·154	0·049	0·033	0·058	0·052		0·044	0·12
I	0·041	0·019	0·077	0·028	0·044	0·019	0·025	0·077		0·08
J	0·015	0·007	0·103	0·002	0·018	0·007	0·001	0·051	0·026	

Diameter.

TABLE III.

STANDARD ERRORS OF DIFFERENCES.

	A	B	C	D	E	F	G	H	I	J
A		0·0608	0·0715	0·0948	0·0594	0·0896	0·0653	0·0411	0·0817	0·06
B	0·0093		0·0854	0·1057	0·0756	0·1010	0·0803	0·0622	0·0941	0·07
C	0·0097	0·0124		0·1122	0·0845	0·1077	0·0887	0·0727	0·1012	0·08
D	00·102	0·0128	0·0131		0·1049	0·1245	0·1082	0·0957	0·1189	0·10
E	0·0079	0·0110	0·0114	0·0119		0·1002	0·0793	0·0609	0·0932	0·07
F	0·0133	0·0154	0·0157	0·0160	0·0146		0·1038	0·0906	0·1149	0·10
G	0·0098	0·0124	0·0128	0·0132	0·0115	0·0157		0·0666	0·0970	0·07
H	0·0059	0·0097	0·0101	0·0107	0·0084	0·0136	0·0102		0·0827	0·06
I	0·0100	0·0126	0·0129	0·0113	0·0116	0·0158	0·0130	0·0104		0·09
J	0·0075	0·0108	0·0112	0·0116	0·0096	0·0144	0·0112	0·0081	0·0114	

Diameter.

TABLE IV.

RESULT OF DIVIDING EACH DIFFERENCE BY ITS STANDARD ERROR.

	A	B	C	D	E	F	G	H	I	J
A		5·7	16·7	4·3	21·3	2·3	14·5	0·9	0·9	1·5
B	2·4		9·9	0·6	12·2	1·4	7·5	6·1	3·6	3·4
C	12·1	7·7		7·0	0·8	9·2	2·8	17·0	11·7	13·0
D	1·3	0·7	8·1		8·1	1·6	4·9	4·7	3·4	3·1
E	0·4	2·3	11·0	1·3		10·5	4·0	21·4	13·5	15·7
F	1·7	0·0	6·1	0·6	1·7		7·1	2·7	1·7	1·2
G	1·6	0·5	8·0	0·2	1·7	0·4		14·8	9·7	10·8
H	6·1	6·0	15·2	4·6	3·9	4·3	5·1		0·5	2·0
I	4·1	1·5	6·0	2·5	3·8	1·2	1·9	7·4		0·9
J	2·0	0·6	9·4	0·2	1·9	0·5	0·1	6·3	2·3	

Altitude.

Diameter.

TABLE V.

SUMMARY OF SIGNIFICANT DIFFERENCES.

+ in altitude; o in diameter.

	A	B	C	D	E	F	G	H	I	J
A		+	+o	+	+	...	+	o	o	...
B	+		+o	...	+	...	+	+o	+	+
C	+o	+o		+o	o	+o	o	+o	+o	+o
D	+	...	+o		+	...	+	+o	+	+
E	+	+	o	+		+	+	+o	+o	+
F	...	...	+o	...	+		+	o	...	...
G	+	+	o	+	+	+		+o	+	+
H	o	+o	+o	+o	+o	o	+o		o	o
I	o	+	+o	+	+o	...	+	o		...
J	...	+	+o	+	+	...	+	o	...	

priate methods, and it has, I hope, been shown that this sort of study is readily practicable for the investigation of variation by working field naturalists. It may want an actual trial to convince others that it is as entertaining as I have found it.

The demonstration of these differences in size is a preliminary to the really difficult enquiry whether we can correlate them with any characters of the individual loci.

Arranging the data in descending order of altitude, we notice at once that three lots, G, C, and E, are conspicuously shorter than the rest, and that of these C is also much narrower. C is certainly the locus of the most inhospitable character by our human standards—high lying, exposed, and bleak.[2] G and E, on the other hand, are the very opposite—low, sheltered, damp, densely shaded places; the shells differ from C in being fatter. D is an old tramroad bridge, very like C and not far from it but much more sheltered. At the other end of the table, H and A are roadside walls with a considerable amount of shade, more shaded than F, I, or J, but much less shaded than E and G. Putting all the facts together, it seems that exposed windy places and densely shaded places produce short shells, while moderately shaded loci are most favourable for the largest growth; roadside walls seem, too, more favourable than others.[3] Why this should be so, requires of course much further analysis of the œcological features along a variety of different lines; this preliminary enquiry enables one, however, to limit such an investigation within practical bounds and examine a few loci, say H, C, and E, in elaborate detail. Note, too, that these tentative conclusions as to the

Locus.	Mean altitude.	Character.	Mean diameter.
H	11·473	roadside: moderate shade	2·617
A	11·436	roadside: moderate shade	2·581
I	11·429	roadside: open	2·540
J	11·348	roadside: open	2·566
F	11·228	roadside: some shade	2·559
B	11·091	roadside: open and exposed[1]	2·559
D	11·024	tramroad bridge: sheltered, high ...	2·568
G	10·489	densely shaded in wood	2·565
C	10·241	tramroad bridge: open, exposed, high	2·463
E	10·171	densely shaded in wood	2·584

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[1] By "open" I mean open to the sun, by "exposed" open to the wind and weather.

[2] In all the loci the substratum is the same sort of stone wall, and the only differences noted were in its surroundings.

[3] Perhaps because of the dust which gets the mineral matter into a more readily soluble state for plants and animals (cf. Science Gossip, vol. iv (1898), p. 343).

relation between size and habitat are likely true only of the n bourhood of Portmadoc; the influence of shading and exposu prima facie related to the prevailing climatological conditions, what produces grateful dampness in Kent may give us a horrid in North Wales.

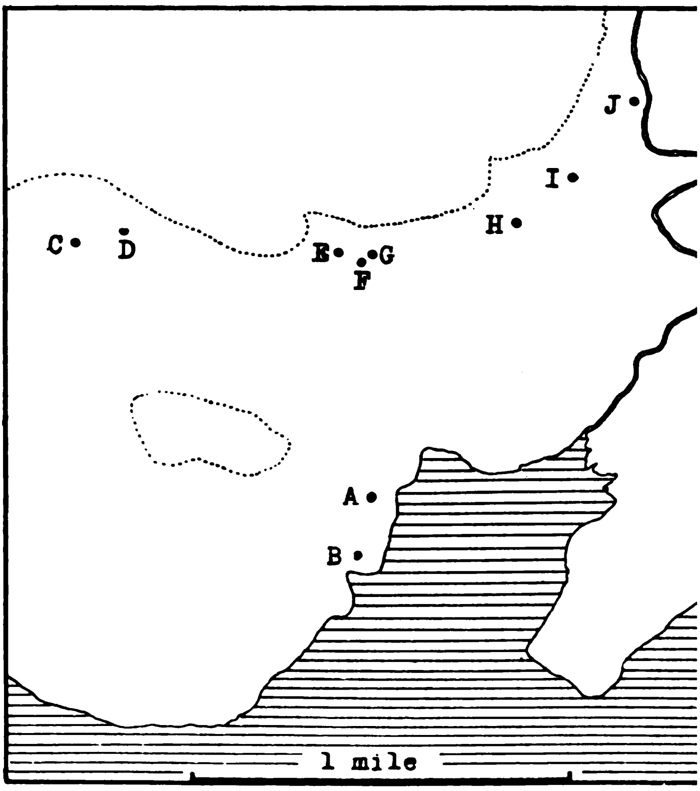

FIG. 1.—Map showing the loci: the Glaslyn river and the 500 fee contour are also indicated.

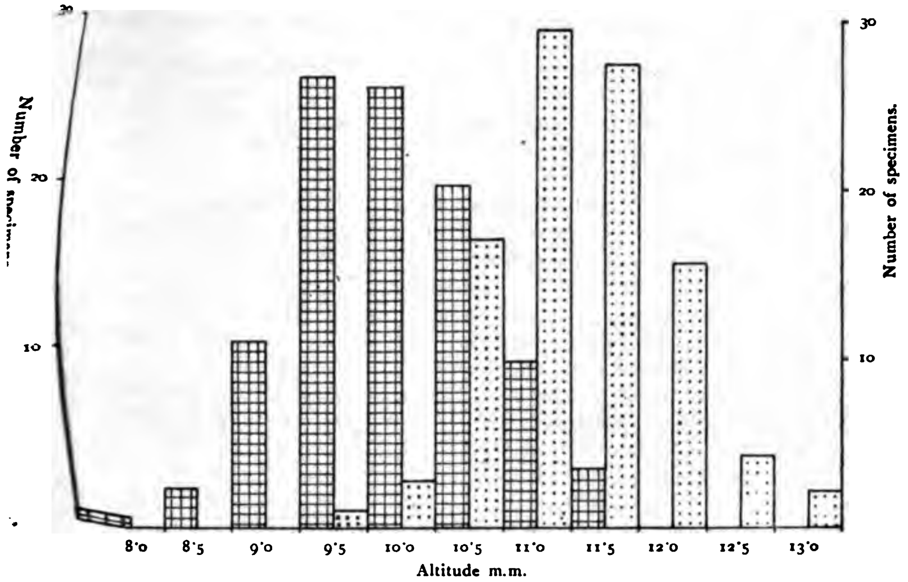

FIG. 2.—Diagram of the distribution of the altitudes of the shells from loci E (lined) and H (dotted), both expressed as if the total were 100.

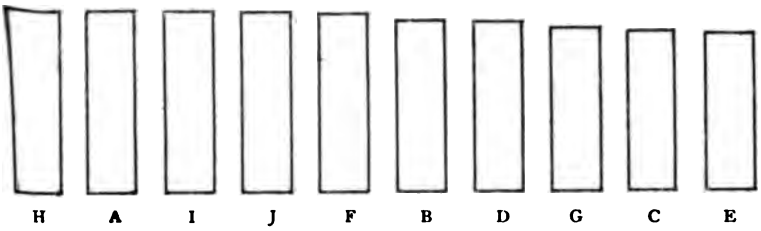

FIG. 3.—Diagram of the mean altitudes and diameters of the shells from the different loci.

◆

Limnæa glabra Müller **at Caldon Low, Staffs.**—In March of this year *L. glabra* was found in great numbers in a small grass-choked ditch, about eight yards long by two feet wide, very close to the south edge of the limestone of which the Weaver Hills ridge consists. The ditch is practically eleven hundred feet above sea-level. The only other species noticed was *Pisidium personatum* Malm. On the occasion of a second visit in June the ditch was quite dry, but *L. glabra* was still present and very common amongst the grass roots and under stones, the large numbers of newly-hatched shells being especially noticeable.—W. E. ALKINS (*Read before the Society*, June 12th, 1918).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

472nd Meeting, held at the Manchester Museum, May 8th, 1918.

Mr. R. Standen in the chair.

New Members Elected.

Hans Schlesch.

Miss Lucia D. Carro.

Candidate Proposed for Membership.

George Nelson, 38, Griffiths Street, Falkirk, Stirlingshire (introduced by W. Denison Roebuck and William Evans).

Exhibits.

By Mr. W. H. Davies: Land shells collected in the Manchester district, including *Helix nemoralis* (vars.) from Baguley; *H. hortensis* (vars.) and *H. arbustorum* from Compstall Wood; also *H. arbustorum* from Gatley Carrs.

By Mr. W. E. Alkins: *H. nemoralis* (vars.) from Castleton, Derbyshire, and from Ellastone and Denstone, Staffs.; *H. nemoralis* var. *castanea* from Wetton Mill, Staffs.; *H. hortensis* from Oakamoor and Denstone, Staffs.

By Mrs. Gill: Species of *Gibbus*.

By Mr. R. Harrison: Various land shells from near Winchester, Hampshire, including *H. hortensis*, *H. cantiana*, *H. virgata*, *H. itala*, *H. caperata*, *H. lapicida*, and *Vitrea nitidula*; also *Clausilia laminata*, *H. striolata*, *V. pura*, *V. radiatula* var. *viridescenti-alba*, *V. crystallina*, etc., from Crabbe Wood, Hampshire.

By Mr. R. Standen: *Triton femoralis* L. dredged off Karachi by Mr. F. W. Townsend, illustrating the growth of a new varix and section, by the formation of the tough epidermal layer prior to the deposition of the calcareous portion.

By Mr. J. W. Jackson: Predynastic pottery from Naquada, Egypt, with painted decoration consisting of boats or galleys and objects suggesting conventionalised cuttle-fishes.

By Mr. J. G. Kitchen: *Limnæa palustris*, *L. truncatula*, *Planorbis leucostoma*, and *Aplecta hypnorum* from Ashley, Cheshire; also *Planorbis crista* from Dunham, Cheshire.

In the Special Exhibit, *Thersites*, series were shown by Mrs. Gill, Mr. J. G. Kitchen, and the Manchester Museum.

473rd Meeting, held at the Manchester Museum, June 12th, 1918.

Mr. R. Standen in the chair.

Donations to the Library announced and thanks voted:

From Mr. J. D. Dean and Dr. W. H. Dall; also "Manual of Conchology," part 96, by H. A. Pilsbry *(from the author)*; and "Molluscan World," vol. 1, 1915, by C. R. Orcutt *(from Mr. G. C. Spence)*.

New Member Elected.

George Nelson.

Candidates Proposed for Membership.

Clyve Cordukes Laverack, Ph.C., M.P.S., Broughton Rise, Malton (introduced by W. Gyngell and J. A. Hargreaves).

Maurice Cook, 13, Victoria Place, Hartlepool (introduced by W. E. Alkins and J. W. Jackson).

Member Resigned.

T. M. Harvard.

Member Deceased.

J. Moorcock.

Papers Read.

"*Neritina fluviatilis* at Chester," by W. H. Davies.

"*Zonitoides nitidus* var. *viridescens* in North Staffs.," by W. E. Alkins.

"*Limnæa glabra* Müll., at Caldon Low, Staffs.," by W. E. Alkins.

"A Scalariform Specimen of *Planorbis carinatus* Müll.," by W. E. Alkins.

Exhibits.

By Mr. W. E. Alkins: Specimens illustrating his three notes; also various others from North Staffs., including *H. lapicida* from Cauldon, *V. vivipara*, *Pl. corneus*, and *L. auricularia* from the canal at Froghall.

By Mr. E. R. Brown: *Agriolimax agrestis*, very pale form, from greenhouse in Brunswick Street, Manchester.

By Mr. W. H. Davies: Specimens of a *Vivipara*, resembling *V. lineata* from Bengal, found in the collection of Mr. W. H. Heathcote, and reported to have come from the canal at Aintree.

By Capt. W. J. Farrer: A living specimen of *H. lapicida*, found with *H. virgata*, near Hesketh Park, Southport (probably introduced).

By Mr. J. G. Kitchen: *Limnæa stagnalis*, curiously eroded, from Ashley, Cheshire, and other species.

By Mr. G. C. Spence: *P. rotundata* var. *grisea* and *H. striolata* var. *rubens* from Prestatyn.

In the Special Exhibit, *Macroceramus*, series were shown by Mrs. Gill, Messrs. R. Standen, G. C. Spence, and J. G. Kitchen.

474th Meeting, held at the Manchester Museum, Sept. 11th, 1918.

Mr. J. Ray Hardy in the chair.

Donations to the Library announced and thanks voted :—

Papers from Messrs. R. A. Phillips and A. W. Stelfox; also "Fourth Annual Report, Lancashire and Cheshire Fauna Committee."

Donations to Autograph Collection :—

From Mr. E. Collier: J. R. Redding, F. N. Fierke, Wm. Baillie, J. H. James, L. J. Smith, John Hawell, J. Grafton Milne, and D. D. Baldwin.

New Members Elected.

Clyve Cordukes Laverack, Ph.C., M.P.S.

Maurice Cook.

Candidates Proposed for Membership.

Harald Mückardt, Drottuinggatan 11, Helsingborg, Sweden (introduced by Hans Schlesch and Chas. Oldham).

E. A. Robins, Swinton Lodge, Essex Road, Watford (introduced by Chas. Oldham and J. W. Jackson).

Alexander J. E. Cave, "Avoca," Hill Lane, Blackley, Manchester (introduced by R. Standen and J. W. Jackson).

W. Falcon, M.A. (Cantab.), Hilton College, Hilton Road, Natal (introduced by H. C. Burnup and J. R. le B. Tomlin).

Rev. Ralph W. Nevill, M.A., Beighton Rectory, Norwich (introduced by Geo. A. Stephen and J. W. Jackson).

Rev. H. A. Soames, M.A., F.Z.S., Hazelcroft, Mason's Hill, Bromley, Kent (introduced by J. W. Jackson and R. Standen).

Member Resigned.

Dr. Fred Baker.

Member Deceased.

Frederick Darnbrough.

Papers Read.

"Rare Shells in 'Shell-Pockets' in the Wirral Sand-Dunes," by J. Wilfr Jackson.

"Reproduction of *Paludestrina jenkinsi*," by A. E. Boycott.

"Notes on Kentish Mollusca," by H. C. Huggins.

"*Valvata* (*Cincinna*) *alpestris* Blauner in Denmark," by Hans Schlesch.

Exhibits.

By Mr. E. R. Brown: *H. virgata* and *H. cantiana* from Rudston, E. Yorks.

By Mr. M. Cook: *H. virgata* and *H. cantiana* from Hartlepool.

By Mr. J. G. Kitchen: *Helix cantiana* from Clifton, Bristol; *H. aspersa* from Weston-super-Mare; *H. striolata* var. *rubens*, *H. hispida*, and *V. cellaria* from Preesall, Lancs.; *Clausilia bidentata* var. *tumidula*, *P. muscorum*, *Vallonia excentrica*, *Vitrea rogersi* (young), and *Peringia ulvæ* from Knott End, Fleetwood.

By Mrs. Gill: South American *Bulimi*.

By Mr. J. W. Jackson: *Helix aspersa* (very dark vars.), and *H. virgata* vars. *leucozona*, *rufulozonata*, *lutescens* and *nigrescens* from Meols, Wirral coast, Cheshire; *Peringia ulvæ* from near the type locality, Estuary of the Dee; numerous fossil shells from "shell-pockets" on the Wirral sand-dunes, including *Vertigo pygmæa*, *V. antivertigo*, *V. angustior*, *V. pusilla*, *V. minutissima*, *Clausilia bidentata*, *Pupa cylindracea*, *P. muscorum*, *Phytia myosotis* var. *denticulata*, *Peringia ulvæ*, etc.; *Bythinella steinii* (var. from Carniolia), and *B. scholtzii* (from Breslau), for comparison with *Amnicola taylori* (from Droylsden, Lancs.). It was pointed out that *B. scholtzii* had impressions of many solitary egg-capsules on the shell, recalling in shape and size those of *A. taylori*; the shape of the shell, too, is closely similar.

It was decided to have the following Special Exhibits:—

November 13th - - *Pleurodonte*, Section I.
December 11th - - *Tellina*.

475th Meeting (Annual Meeting), held at the Manchester Museum, Oct. 12th, 1918.

Mr. R. Standen in the chair.

The following members and friends were present:—Messrs. E. Collier, B. R. Lucas, C. Oldham, W. H. Heathcote, F. Taylor, G. H. Taylor, E. R. Brown, C. H. Moore, G. C. Spence, W. H. Davies, W. E. Alkins, M. Cook, E. D. Bostock, J. G. Kitchen, Mr. and Mrs. J. W. Jackson, and Mr. and Mrs. Gill.

Donations to the Library announced and thanks voted:—

Papers from Lieut.-Col. H. H. Godwin-Austen, Messrs. A. W. Stelfox, C. Hedley, and J. R. le B. Tomlin; also "Brachiopoda: British Antarctic ('Terra Nova') Expedition, 1910," by J. Wilfrid Jackson (*from the author*); and "An Introduction to the Theory of Statistics," by G. Udny Yule (presented by Dr. A. E. Boycott).

Donations to the Cabinet announced and thanks voted:—

Helix hortensis from Idmiston, Wilts., with decided *nemoralis* facies as to shell, oved by dissection to be *hortensis*, from Dr. A. E. Boycott. *Limnæa auri-*

cularia (curiously expanded forms) from Startop's End Reservoir, Tring, Herts.; *Unio tumidus* from River Teme, Bransford, Worcester, from Mr. C. Oldham.

Appointment of Auditors.

Messrs. C. H. Moore and E. R. Brown were appointed Auditors.

Appointment of Scrutineers.

Messrs. F. Taylor and W. H. Heathcote were appointed Scrutineers.

New Members Elected.

Harald Mückardt, E. A. Robins, A. J. E. Cave, W. Falcon, Rev. R.W. Nevill, Rev. H. A. Soames.

Candidates Proposed for Membership.

John Hill, 8, Stanley Street, Leek, Staffs.

Edmund Ernest Perry, 6, Stuart Crescent, Wood Green, London, N. 22 (both introduced by W. E. Alkins and J. W. Jackson).

Members Struck Off the List (Rule IV.).

F. N. Balch, Mrs. H. D. Brainerd, S. W. Geiser, C. Gerland, A. da C. Gomez, G. Humphreys, J. E. A. Jolliffe, L. R. W. Loyd, A. Macindoe, J. McMurtrie, G. Penrose, L. R. Reynolds, J. Ritchie, jun., and W. T. Stonestreet.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1918-1919 had been unanimously elected as nominated by the Council (see page 2).

Papers Read.

"Description of New Variety of *Arion ater*," by W. Denison Roebuck.

"*Vertigo alpestris* in Borrowdale, Cumberland," by Chas. Oldham.

"*Pisidium parvulum* in the Great Ouse and the Severn," by Chas. Oldham.

"'Ground' Clausilias," by the Rev. Dr. A. H. Cooke.

Presidential Address.

Dr. A. E. Boycott, F.R.S., who was prevented from attending by military duties, sent an interesting address on "Local Variation in *Clausilia bidentata*."

A cordial vote of thanks was passed to the retiring President for his services.

The Society's best thanks were also voted to the authorities of the Manchester Museum for permission to hold meetings on their premises

Exhibits.

By Mr. Chas. Oldham:—*Planorbis corneus* with red-fleshed animals, Barnet, Herts. *Vertigo alpestris* and *V. pusilla*, Cumberland. *Helix neglecta*, Luddesdown, Kent (coll. A. S. Kennard). *Helix limbata*, Teignmouth (coll. H. C. Huggins). *Pisidium parvulum* and associated species from the Great Ouse and Severn.

By Mr. M. Cook:—*Helix hortensis*, Northenden, Cheshire; and a series of shells from Hartlepool.

By Mr. W. E. Alkins:—*Helix striolata* (white), Lillingstone, Dayrell, Berks.; and varieties of *Helix* from many Staffordshire localities.

By Mr. G. C. Spence:—A fine series of *Eucalodium* and *Cœlocentrum*.

By Mr. R. Standen:—Growth-stages and varieties of *Cypræa mauritiana*, *C. pantherina*, *C. arabica*, and *Trivia europæa*, ; young forms of *Aporrhais pes-pelicani* and *A. serresianus*, and many locality sets of the same; also *A. occidentalis* from Labrador, and *A. senegalensis*.

By Mr. W. H. Heathcote:—A large series of non-marine shells from many localities in England and Scotland.

By Mr. Fred Taylor :—Local freshwater shells.

By Mr. C. H. Moore :—*Ranella* and *Cerithium.*

By Mr. J. G. Kitchen :—Local land and freshwater shells.

By Mrs. Gill :—*Cochlostyla.*

By Mr. W. H. Davies :—Reversed *Helix virgata* from Llandudno ; *H. nemo*[illegible] from Péronne, France.

By Mr. J. W. Jackson :—Ring Cowries (*Cypræa annulus*) used as money in the markets of Ibadan, West Africa.

By Dr. A. E. Boycott :—Series of *Clausilia bidentata* to illustrate his address *Helix hortensis* from Idmiston, Wilts., with decided *nemoralis* facies as to the shell, but proved by dissection to be *hortensis.*

By Mr. E. R. Brown :—Varieties of *Helix virgata* from Rudston, Yorkshire.

By the Manchester Museum :—A number of drawers of Continental *Helicidæ*; *Succinea* ; *Partula* ; *Amphidromus* ; *Purpura lapillus* from many localities (from the R. D. Darbishire collection) ; *Cypræa* and *Ovula* (Townsend collection).

ANNUAL REPORT.

THE present is the Forty-Second Annual Report of the Society. Since our last annual meeting we have lost eight members by death, four by resignation, and fourteen names have been struck off the roll in accordance with Rule IV., making a total loss of twenty-six. On the other hand, seventeen new members have been elected (including six elected at this meeting). The membership of the Society now stands at 287 (including ten honorary members).

The deaths that the Society has to deplore are those of the Rev. F. H. Wood, Mrs. L. J. Smith, Messrs. E. Pattison, J. W. Roberts (killed in France), E. D. Marquand, H. Champ, J. Moorcock, and F. Darnbrough.

The usual monthly meetings have been held at the Manchester Museum, and despite the extra duties entailed upon members by the war, these have been fairly well attended. In addition to general exhibits, the following special exhibits have been held :—*Chloritis*, *Camæna*, *Turricula* (*Mitridæ*), *Natica*, *Arca*, *Pteropoda*, *Thersites* group of *Helix*, and *Macroceramus.*

Some twelve or more papers and notes have been read, several of which have already been printed in the *Journal.*

The XVth volume of the *Journal of Conchology* is completed with the September number, and comprises ten numbers in place of the usual twelve. This curtailment has been occasioned by the increased cost of printing and the paper shortage owing to the war. The Council have under consideration the advisability of a further curtailment in the near future, as it is feared that the finances of the Society will not be sufficient to meet the ever increasing cost of publication. In this connexion the Council wish again to emphasise the fact that authors wishing to have illustrations to their papers must be prepared to meet the cost of the same.

It is satisfactory to record that the Lancashire and Cheshire Faunal scheme has been largely assisted by local members of the Society, and several important discoveries have been made during the last twelve months. The most noteworthy are the re-discovery of *Planorbis dilatatus* in the Bolton Canal, near Clifton Junction, by Mr. W. H. Davies, and the discovery of *Amnicola taylori* (including a reversed example) in the Stockport Canal, near Reddish, by Mr. F. Taylor.

The Library, which has been fairly well used, has received several notable additions, the chief donors during the year being Drs. W. H. Dall, H. A. Pilsbry, and J. C. Melvill, Lieut-Col. H. H. Godwin-Austen, Messrs. C. M. Steenberg, A. W. Stelfox, C. Hedley, A. S. Kennard, B. B. Woodward, and the Marchese di Monterosato.

The Council again sends its most appreciative greetings and good wishes to those members who are on active naval or military service.

RECORDER'S REPORT.

The Hon. Recorder has to report that steady progress has been made during the year with the filling-up of blanks in the Census as far as the circumstances of the present time render this possible. Not a few have been filled up, and in two cases the slug fauna has been completed, thanks to Mr. G. B. C. Leman in Shropshire, and Mr. Charles Oldham in Huntingdonshire, who have paid special attention to them this year.

REPORT OF THE LEEDS BRANCH

For the Twelve Months ended 30th September, 1918.

Twelve meetings have been held during this period, six in the field and six indoors. The field meetings have been thinly attended owing to the lack of railway facilities. The field work has been mostly of an œcological character, chiefly instigated by the discussion of Capt. A. E. Boycott's presidential address. Three papers have been given. In October last at Leeds Mr. W. H. Hutton gave an interesting paper on "Pearl and Pearl-Bearing Mussels." He traced out their early historical records, and concluded with notes on their economic and monetary value. The November meeting was responsible for a general display of mollusca. The December meeting was the Branch's annual one for election of officers, etc. The January meeting of this year was devoted to a discussion of Capt. A. E. Boycott's presidential address at the annual meeting of the Conchological Society in Manchester, "On the Habits of Freshwater Mollusca." Mr. W. Denison Roebuck introduced the paper, and during the discussion numerous instances were brought forward of certain species occupying habitats quite in opposition to the experiences of Capt. Boycott. It was decided that in future full data on the lines suggested and worked out by Capt. Boycott should be compiled in connection with some of our local habitats. At the February meeting Mr. Roebuck gave an interesting address on the British Slugs. The species were dealt with in the order in which they became members of the British fauna, beginning with *Limax maximus* and ending with *Arion minimus*. He also expounded the characters by which they are distinguished, and their geographical distribution. In March, Mr. J. E. Crowther gave "Notes and Observations on *Limnæa stagnalis*." His observations had xtended over many years, and covered all stages of growth, from the egg to he adult shell, the effect on growth and numerical occurrence of change of nvironment, their dominancy over other species, etc. The paper was a most nstructive series of careful œcological observations. Members can be congratulated n the enthusiasm they display in keeping up the interest of the Branch under the any difficulties of the past year. Our membership at the present time is 28, ith two corresponding members. Mr. J. Digby Firth, F.L.S., F.E.S., is our resident.

F. Booth, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

ONLY four meeting have been held during the past year. The attendance ha necessarily been small.

Special exhibits were *Xenophora* ; and *Murex*, sections *Phyllonotus*, *Pteronotu* and *Chicoreus*. Mr. A. S. Kennard continued his interesting series of Notes o British Non-Marine Mollusca and the closely-allied Continental forms.

We are again indebted to Mr. Dacie for allowing us to use his office for ou meetings. J. E. COOPER, *Hon. Sec.*

476th Meeting, held at the Manchester Museum, November 13th, 1918.

Mr. E. Collier in the chair.

Donations to the Library announced and thanks voted :

"Report on the Mollusca (Lancashire and Cheshire Fauna Committee)" by J. Wilfrid Jackson *(from the author)*.

"Elements of Conchology," by the Rev. E. I. Burrow *(presented by Dr. A. E. Boycott)*.

Donations to Autograph Collection :

Letter from the late Henry Suter *(presented by Chas. Hedley)*. Letter from L. E. Adams *(presented by E. Collier)*.

New Members Elected.

John Hill, Edmund Ernest Perry.

Candidate Proposed for Membership.

T. O. Bartlett, Lloyd's Bank, Ltd., Westbourne, Bournemouth (introduced by J. W. Jackson and E. Collier).

Papers Read.

"*Spirula peroni* Lam. in North Devon," by Alan Gardiner, B.Sc.

"*Hygromia revelata* Fér. in North Devon," by Alan Gardiner, B.Sc.

"*Succinea oblonga* Drap.," by Alan Gardiner, B.Sc.

"The Occurrence of *Hartmannia septemspiralis* (Raz.) and *H. patula* (Drap.) in England," by H. C. Huggins.

"Researches into the Hereditary Characters of some of our British Mollusca. Part 3 : *Helix nemoralis* and *H. hortensis*," by A. W. Stelfox, M.R.I.A.

Exhibits.

By Mr. E. Collier : *Helix nemoralis* and *H. hortensis* to illustrate Mr. A. W. Stelfox's paper.

By Mr. J. W. Jackson on behalf of Mr. F. M. Dyke : *Vitrina angolensis* Mor., shells and animal ; *Limicolaria aurora* (Jay) ; *Achatina buchneri* Marts. ; and *Burtoa* sp., from the Belgian Congo.

By Mr. R. Standen : *Vertigo pygmaea*, Ore, near Hastings ; and *Neritina cumingi* Q. and G., with egg-capsules attached, from Philippines.

By Mr. G. C. Spence : *Euonyma natalensis* Burnup, and eggs ; *Pseudachatina downsi* Gray, *P. wrighti* Sow., and *P. pyramidata* Kob. ; and *Pseudotrochus bifrons* Shutt., from Gaboon River.

By Mrs. Gill : A large series of *Cominella*.

In the Special Exhibit of *Pleurodonte* (sensu stricto) fine series were shown by Mrs. Gill, Messrs. E. Collier and J. R. Hardy, and the Manchester Museum.

FIELD NOTES ON HELICODONTA OBVOLUTA Müller.

By H. BEESTON.

(Read before the Society, February 14th, 1917).

SINCE being domiciled in Hampshire, no shell has interested me more than that very local and comparatively rare mollusc, *Helicodonta obvoluta*. Living within easy reach of its well-known habitat—Ditcham Wood—and enjoying full liberty to explore it, I have had special opportunities of observing, studying and collecting the shell in its native haunts. It is not my purpose to describe either the animal or the shell. I desire rather to discuss several aspects from the collector's point of view.

The species was discovered in this country in the year 1830 by Dr. James Lindsay, who resided for some time in the district, and recorded the discovery in the Linnean Transactions, xvi, p. 765. It was unknown to Turton when he published his first edition of "The Manual of Land and Freshwater Shells of the British Islands" in June, 1831, but it appeared on plate xi of Gray's edition, issued in 1840.

I have no positive evidence when copulation takes place, but am inclined to think it occurs in early spring—about April or May.

Miss Hele's[1] observations accord very well with my own, as I more frequently find very young specimens in June, July, and August than during the earlier or later months. But I am of opinion that eggs are laid successively all through the summer, as shells in all stages of growth are to be found very late in the autumn, and occasionally in winter, about one-third grown, with the mouth sealed with a calcareous plate. Whether the eggs are laid in batches or singly I am unable to say, but am inclined to think they are deposited either singly or at most two or three at a time, as I have never been able to discover more than one or two young ones together, and these usually in various stages of development. In searching for the species I have frequently found small white eggs, which I believe to be those of *H. obvoluta*, among the dead beech leaves, and these certainly were not laid in clusters, as most of the larger *Helices* are usually found. The young of *H. obvoluta* are not gregarious; and if later observations should prove that eggs are laid in batches, then the young quickly separate.

Mr. L. Dawes' experience of breeding this snail in captivity differs from mine. He writes as follows:—"The eggs are white, *laid in clusters of from twelve to twenty*, mostly sixteen, the time of laying being from May to July. I saw but one case of copulation, and that in May, I think," but adds "I have never found their eggs in the woods." The fact should not be lost sight of that what the creatures do in captivity is no criterion that the same occurs in the natural wild state. Mr. Dawes' specimens were bred in a large flower pot covered with a sheet of glass. Those which are hatched in spring attai maturity by the end of October or beginning of November, but there may be a few hatched later, which finish growth in spring after hibernation.

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[1] *Journ. of Conch.*, v, 84.

Habits and Habitats.—

Hibernation usually begins in November, but if the weather remains mild and open, the animals may be found above ground much later, even in December, only cold frosty weather driving them to seek shelter, and form the winter epiphragm, which is chalky, white and calcareous, contrasting very beautifully with the pink mouth and dark red of the shell. The snails are hardy, and able to withstand a fair amount of cold, but if after a spell of frost the weather again becomes mild the snails push off the epiphragm and crawl out for a meal, often remaining in this lively state until driven to hibernation again by a recurrence of cold weather.

Searching for specimens in winter is difficult and tiring work, as it necessitates close scrutiny of the masses of leaves and débris on hands and knees. There are two or three places the snails seem to prefer, viz., heaps of dead leaves mixed with sticks, and the underground crevices of dead and much decayed moss covered stumps of *beech trees.* One or two writers state that the snails hibernate at the roots of hazel, but I have never found them in such a situation.

For several years I was unable to find the winter hiding place, and am indebted to Mr. Lionel E. Adams for giving me the first clue. He advised me to tear up the old beech roots, and there, hidden away in the interstices of the roots, sometimes a considerable distance below the surface, I discovered the snails: in such situations the animals had not always formed the usual calcareous epiphragm, but seemed quite ready to leave their hibernaculum on the first intimation of mildness above ground.

Among the heaps of dead leaves and sticks a few inches from the surface, the case seemed different. There the snails had formed the epiphragm, and it was an easy matter to pick them out, as the chalky white plate showed up quite plainly against the brown of the dead leaves.

The snails evidently form an epiphragm whenever they return to hibernation after coming out, and I am of opinion they do this several times during the winter, except when they hide underground in roots. The chalky epiphragm is also formed in summer; whenever a spell of dry weather comes on, the animals crawl among the leaves or beneath a piece of timber, form the epiphragm, retreat far back into the shell, and remain thus sealed up till damp weather returns, when they again emerge.

Although the heaps of leaves provided a fair number of hibernated shells, the beech stumps supplied the majority. The snail appears to seek the company of its fellows in autumn and winter, and several are frequently found quite close together in the stumps and among the leaves, and the underside of a dead branch often provides a number of specimens in autumn just before hibernation takes place. In the adult stage *H. obvoluta* is a gregarious species. Apropos of this subject of hibernation, I was much amused, not to say surprised, at a statement contained in an article in *The Zoologist*, August, 1915, pp. 312–314, by Mr. E. W. Swanton on *H. obvoluta.* He there states:—"Some years ago, upon pointing out the shell to an old game-keeper, he remarked that he knew it well, and that once when digging out rabbits in the wood in winter he came across some of the shells '*stuck together in a lump as big as my fist*,' an observation tending to show that these molluscs assemble for hibernation in the manner often adopted by *Helix aspersa*."

A very small amount of experience of the habits of *H. obvoluta*, particularly in winter, would convince anyone that the remarks of the "old gamekeeper" were erroneous. As before pointed out, the snails form an epiphragm during hibernation, and are never under any circumstances found "stuck together." They lie scattered about singly among the leaves, although one may often find several specimens in the space of a few square feet.

H. aspersa is abundant in the beech woods, and hibernates among the roots of trees (hazel frequently), and a rabbit hole would constitute an excellent means for the snails to find their way among the tree roots. I have on one or two occasions found "bunches" in such places, glued tightly to the roots, flints, and each other.

H. obvoluta is very abundant in the beech woods where it occurs, and is sometimes much more plentiful than *H. lapicida*, and quite as numerous as *Pomatias elegans.* On many occasions I have obtained over one hundred specimens during a short winter afternoon, and in frosty weather.

Mr. E. W. Swanton states that "It is *always* associated with beech trees." I cannot concur in this; it is not strictly confined to beech trees, as the following observations will abundantly prove, communicated to me by Mr. A. W. Stelfox in April, 1908. He says:—"I walked over the downs and down to a little very old, deep cut, Sussex lane. On the right-hand side, i.e., facing west, is a dense scrubby vegetation of ash, maple, hazel, thorn, bramble, with much ivy on the ground." Here he found *H. obvoluta* alive in quantity. Then he adds significantly: "I don't believe there is a beech nearer than half-a-mile away." He also expresses the opinion that "the association of *H. obvoluta* and the beech tree is pure coincidence and not intentional." Possibly at some earlier period this particular district may have been covered with beech woods, and, given suitable conditions of shelter and food, the molluscs would no doubt accommodate themselves to the altered environment.

Mr. Clement Reid some years ago carefully noted the localities where *H. obvoluta* was found by him in West Sussex, one of which was a hazel copse near Chilgrove. Respecting this habitat I quote the following: "At some of the localities I only saw bleached shells, but I cannot now say which these were. Chilgrove was one of them; so that the shell might date from a time when it was a beech-wood and not a hazel copse." I am unable at present to say whether the snail is to be found there alive now.

Unlike some other species, *H. obvoluta* when it completes its growth in spring does not show growth lines, perhaps owing to the thick hirsute epidermis. The animal attains maturity in six or seven months, and the best cabinet specimens are those which complete the development in spring, as the epidermis is generally then quite perfect. Those reaching maturity in autumn are usually badly "weathered," often being quite denuded of hairs and epidermis, and much bleached.

I wish here to make some remarks on statements found in the earlier manuals on British mollusca.

In Dr. Gray's Turton, page 139, respecting the habitat of *H. obvoluta*, he says:—"Inhab. among moss near roots of trees." It may occasionally be found among moss, but my experience is that its chief habitat is among the leaves, where in the daytime it may be found sticking on the undersides well out of sight, and very frequently at a considerable distance from the beech trees. In damp weather it may be seen crawling on the moss which covers the decayed, partly buried stumps of the old beech trees, left to rot after the trees have been felled, and from the crevices of which it has crawled after hibernation. But it is only in spring that it may be found on moss; for the rest of the year it seems to prefer the shelter of leaves or fallen timber. When found near roots of trees I believe that it is on its way to feed on the trunks, and may take shelter temporarily there. I have never found the snails in the crevices between the roots of the trees. Dr. Gwyn Jeffreys (vol. 1, p. 230) gives:—"Habitat: on stumps and *at roots* of trees in woods." This is more correct than Dr. Gray's statement. How often erroneous statements once made are perpetueted by copying. But of this habit more later.

In Gray's Turton the name "Brenton" should read "Buriton," a village about three miles south of Petersfield, nestling under the northern escarpment of the South Downs. Then, again, Dr. Gray states that *H. obvoluta* is found "along with *Zonites nitidus.*" Dr. James Lindsay, the discoverer, wrote "*Helix nitida.*" Evidently *Z. cellarius* is meant. *Z. nitidus* is not an inhabitant of woods, its habitat being marshes, ditches, banks of streams, lakes, and ponds. Jeffreys mentions *Z. cellarius* and not *Z. nitidus* as an associate of *H. obvoluta*, and there is little doubt this is the species alluded to by Gray; *Helix nitida* of Draparnaud's *Hist. Nat. Moll.* being the same as *H. cellaria* Müller.

Since I have alluded to this association, I may mention the following species as occurring commonly in the woods of the downs with it:—*Limax arborum*, *Arion ater* (several varieties), *Vitrea alliaria*, *V. cellaria*, *V. pura*, *V. crystallina*, *V. nitidula*, *Helix aspersa*, *H. nemoralis*, *Hygromia striolata*, *Hy. rotundata*, *Helicigona lapicida*, *Clausilia bidentata*, *Cl. laminata*, *Cl. rolphii*, *Ena montana*, *E. obscura*, *Pomatias elegans* (varieties). To these Mr. A. W. Stelfox adds:—*Arion circumscriptus*, *A. intermedius*, *Agriolimax agrestis*, *Vitrina pellucida*, *Hygromia hispida*, *H. cantiana*, *H. hortensis*, *H. arbustorum* and *Cochlicopa lubrica.*

Again reverting to Gray, he states *H. obvoluta* "is found facing the north." From this statement the natural conclusion is that *H. obvoluta* is restricted to the northern aspect of the Downs. This is not so, as it is abundant on the southern side, and more plentiful and of larger size than on the northern slopes. Dr. Gray further says it is "more rare than the other species mentioned," the "other species" being *H. striolata.* The reverse of this actually obtains, for next to the *Clausiliæ* it is the most abundant shell of the woods, in many places outnumbering *H. lapicida* and *H. striolata.* It is quite as abundant as *Clausilia laminata* or *Cl. bidentata.* Under suitable conditions of weather it is quite easy to collect one hundred specimens in an hour, while at other times anyone not acquainted with the habits of the animal would fail to obtain a single specimen in the same time. A friend of mine once spent a week in the vicinity, and visited the woods each day, but only succeeded in obtaining half-a-dozen specimens.

Gray also says "It may probably have been introduced with some foreign plants and escaped." At the time this was penned the range of the species was not so well known as it is now, and it was thought to be quite confined to the Ditcham Woods, which extend some considerable distance along the Downs. If the species had been restricted exclusively to Ditcham Woods, then the theory of foreign introduction might have been accepted, as Ditcham House is situated in the centre of the woods, on the ridge of the Downs. But the snails are found miles away, both east and west from this central wood, and in my opinion are truly indigenous.

It was recorded many years ago by Mr. Tomlin from Crabbe Wood, near Winchester. This wood is situated on the north-western extremity of the South Downs, twenty miles from Ditcham Wood. This is the farthest point westward to which the species has been traced. Eastward it occurs as far as Storrington in Sussex, fifteen miles from Ditcham along the same chalk range, and as far as I am able to judge, it is strictly confined to the chalk formation.

This localised snail I feel convinced is a remnant of the ancient continental fauna, which had managed to establish itself as far north as the South Downs and possibly the North Downs before our islands became finally separated from Europe. It is more than likely that it spread across the great chalk hills which then connected Hampshire and Sussex with the chalk ranges of France, and became isolated and confined to the present South Downs by the denudation of the chalk ridges which then covered the Weald. The species had probably not extended eastward into Kent before isolation occurred, while it had not extended its range westward beyond Crabbe Wood. Between Stoner Hill, a mile or so north-west of Petersfield, and Crabbe Wood the species has apparently disappeared. There was a time probably when it existed the whole length of the range of hills from Storrington and in all probability even further to the east, to beyond Winchester, but the destruction of the great woods which once clothed the Downs has been the means of extirpating the species. Of course it is just possible that it still exists in isolated patches of beech woodland, but there are few suitable woods of large extent remaining between Stoner Hill and Crabbe Wood, and these are mostly plantations of comparatively recent growth. It is quite possible that as the older woods disappear and are replaced by plantations of oak, fir, or other timber the species will eventually die out. There are one or two places where twenty years ago I obtained living specimens, but where now not even a dead shell can be found. I am strongly of opinion that the species is a decadent one.

(*To be concluded*).

THE

JOURNAL OF CONCHOLOGY.

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OBITUARY NOTICE:

WILLIAM DENISON ROEBUCK, M.Sc., F.L.S., etc.

By J. W. TAYLOR, M.Sc.

(Read before the Society, April 9th, 1919).

By the lamented death of Mr. W. Denison Roebuck, of Leeds, the Society is deprived of one of its Founders, as well as one of its most faithful and enthusiastic adherents, while conchology and science generally lose a devoted, successful, and disinterested follower.

He was born in Leeds on January 5th, 1851, and spent his early years with his parents in the village of Pannal, near Harrogate, a circumstance which probably gave a practical turn to that love of nature which clung to him through life.

After a long, healthy, and active life, he was struck down without warning by a paralytic stroke on January 19th, and died on February 15th, in the sixty-ninth year of his age.

Mr. Roebuck was by nature and instinct a bibliographer, statistician, and bookworm, and on entering upon a practical scientific career commenced and consistently kept an accurate record of his captures and observations.

Mr. Roebuck's scientific writings have been numerous and varied, embracing valuable contributions, not only to conchology, but to entomology, mammalogy, and other subjects, though the only complete work with which he was identified was "The Handbook of Yorkshire Vertebrates," in collaboration with his old friend, Dr. W. Eagle Clarke.

He was also closely associated with the inception of "The Monograph of the Land and Freshwater Mollusca of the British Isles," for many years diligently assisted in its preparation, and especially collaborated with the author in the production of the second volume, which is devoted to the elucidation of the British slugs, for which Mr. Roebuck's special studies particularly fitted him.

This wealth of his interests is demonstrated by the grateful ackno ledgments of his aid by various authors, amongst whom may l specially mentioned the late Mr. T. H. Nelson, the author of "Tl Birds of Yorkshire," and Mr. G. T. Porritt, who wrote "Yorkshi Lepidoptera."

Mr. Roebuck was one of the four founders of the Conchologic Society of Great Britain and Ireland in 1876, and for many years Secretary. He drew up the original code of rules. He was a pa President, and one of the ten Honorary Members of the Society.

Though possessing a wide and accurate knowledge of oth branches of science, he was especially attached to conchology, l chief interests being the geographical distribution of life, and t specific and varietal characters of the British terrestrial slugs.

The late Prof. Simroth, of Leipzig, named in his honour *Urocyc roebucki*, a large and conspicuous East African slug.

The scientific work with which his name will always be associat is the institution of the "*Authenticated Census*" of British Non-Mari Mollusca. This project, which is an adaptation of Mr. Watso celebrated system of botanical records, was first suggested by M Roebuck and adopted by this Society in 1881, and has for its obje the acquirement and systematic compilation of verified records.

The system has now been in operation for about forty yea during which time it has been steadily carried on chiefly by his o personal effort and labour. There are now upwards of thirty volum in which are contained more than 60,000 separate records. T conchological world was looking expectantly forward to the publi tion at an early date of a full and complete census of our Brit species, which he, in conjunction with Prof. Boycott, was prepari It is the Professor's intention to complete and issue this as a trib to the memory of Mr. Roebuck.

The effect of this happily-conceived scheme is that England n stands far ahead of any other country in the world for the prec and accurate knowledge of its non-marine mollusca, and it may a be affirmed that the knowledge of the precise distribution of t group in the British Isles is in advance of that relating to any ot group of British animals, while it is highly probable that our inform tion of the dispersal of our species in other countries is greater th is generally known by the foreign scientists themselves.

The Leeds Conchological Club, a local and vigorous associati with whose foundation and organization he was also intimately ider fied, owes much to his self-denying activity and devotion. T appreciation of his great services and sacrifices was so univer amongst the members that, as an expression of their personal resp and esteem, he was spontaneously selected as Honorary Life Preside of the Club, a compliment which he highly valued.

Mr. Roebuck was also the inspiring spirit which evolved "The Yorkshire Naturalists' Union," an organization of upwards of forty local Natural History Societies, and second only in influence and importance to the British Association.

On his retirement from the Honorary Secretariat in 1902, after eighteen years service, he was elected to the Presidential Chair, and the members further evidenced their appreciation of his services by presenting him with a very handsome testimonial and a beautifully illuminated address.

Mr. Roebuck was furthermore the instigator of the Lincolnshire Naturalists' Union, in whose prosperity and efficiency he took a lively interest, attending most of its meetings and excursions. In 1909 he was chosen President, and in commemoration of his occupancy of the post, the Society published in its Transactions for 1915 an admirable memoir of his life and work by the Rev. E. Adrian Woodruffe-Peacock, accompanied by an excellent portrait in University robes.

In 1870 he was also associated in the institution and organization of the Leeds Naturalists' Field Club, of which he was Secretary for a great number of years. While occupying that post, and that of recording officer, he compiled a large number of volumes of classified records of all forms of life existing in Yorkshire. He also occupied the Presidential Chair.

A very graceful and fitting recognition of his life-long devotion to science was made in July, 1915, when the University of Leeds publicly bestowed upon him the honorary degree of Master of Science.

He was intimately acquainted with every part of Yorkshire and Lincolnshire, and had a sound knowledge of many other parts of the country. In 1902–4 he travelled extensively abroad, visiting Australia, New Zealand, Northern India, South Africa, Egypt, etc., making many interesting discoveries of European mollusks which had been unwittingly introduced into and become acclimatized in these countries and were dispossessing the prior occupants.

His public spirit in accumulating for the use of others the enormous masses of classified information can scarcely be overestimated, so that it can be truly said that though he has left us, he still speaks to us and helps us as of yore. We shall all miss his inspiring help, wise counsel and encouragement in all good work we may hereafter engage upon, but no one of his many friends and admirers will miss him more than the writer of this inadequate notice, who for a lifetime was intimately associated with and dearly valued his friendship.

The remains were cremated on February 19th at Lawnswood Cemetery, Leeds, and the number who attended attested to the respect and esteem in which he was held.

OBITUARY NOTICE:

THE REV. CANON ALFRED MERLE NORMAN, D.C.L., F.R

By J. COSMO MELVILL, M.A., D.Sc.

It is with deep regret that we chronicle the passing away, at his r dence at Berkhamsted, of the well-known scientist, Canon Norm on October 26th last. He had attained the ripe age of 88 years.

Born in 1831, he was son of Mr. John Norman, D.L., Iwod Hou Somerset. Educated at Winchester and Christ Church, Oxford, became successively Rector of Houghton-le-Spring and Burnmo Fence Houses, both in County Durham, and in 1885 was appoin to an Honorary Canonry of Durham Cathedral.

As regards his scientific attainments and aims, he took the No sea as his main basis of action, and most assiduously dredged th waters, amassing thereby an amount of material such as had b hardly, if ever, brought together by one man before; this mate embracing every group of Marine Zoology, Echinodermata, Spon Crustacea, Mollusca included, and he had the rare pleasure of scribing most of his own discoveries in the pages of "Annals Magazine of Natural History" mainly, though he did not con himself to this periodical entirely. By degress this vast collect now dubbed the *Museum Normanianum*, attracted the notice of scientific world, and he was soon gazetted one of the chief authori on Marine Invertebrata, a distinction richly deserved. Possibly chief love was for the Crustacea, but nothing in Marine Zoology neglected by him. He had taken part, likewise, in several of cruises instituted mainly by England and France, such as thos the "Lightning," "Porcupine," "Valorous," "Talisman," and " vailleur," for instance. His vitality and vigour were remarkable, seldom equalled. The last time I had the pleasure of conversing him was in 1907, at the sale of the Da Costa Collection of Mollu at Stevens' Auction Rooms, and he certainly looked much you than his years. In 1908–1910 he parted with his wonderful muse generously bestowing it upon the nation, and it is now housed in Natural History Museum, South Kensington. He had previo catalogued it all in his History of the *Museum Normanianum*. contains about 6,000 species of *Crustacea*, 3,500 or more *Spongi* many *Echinodermata*, and an almost complete collection of Moll found in these northern seas, a detailed account of which, writte Messrs. W. Denison Roebuck and Robert Standen, in 1892, on occasion of a visit paid by them to Burnmoor Rectory, may be fo in *Journal of Conchology*, vol. vii., pp. 124–126. This gives n information of the origin and important parts of the collection.

species that shews much variation is represented most amply with a profusion of fine specimens.

He was awarded the Gold Medal of the Linnean Society in 1906; was F.R.S., F.L.S., M.A. (Oxon), LL.D., and D.C.L. (Durham). In 1892 he accepted the Presidency of the Conchological Society of Great Britain and Ireland; and subsequently that of the Museums' Association.

The memory of one always kind-hearted, generous, sympathetic, and wishful to aid those who asked of him advice, will remain green for many a generation. The funeral took place at Burnmoor, where he had resided so many years.

◆

Unauthentic Records of Theba cantiana (Mont.) monst. **sinistrorsum in England.**—In January, 1889, Mr. J. W. Taylor recorded the occurrence of sinistral examples of *Helix* (*Theba*) *cantiana* in Wiltshire, stated to have been found by Mr. Rippon, of Norwood.[1] In January of this year Mr. Rippon's collection came into the possession of the National Museum of Wales, and in June last a detailed examination of the various cabinets was made. About this time Mr. Taylor wrote asking me to keep a look-out for sinistral specimens in order to verify the above record, and in the *Helicidæ* cabinet a tray was found containing *five* examples, labelled "*Helix cantiana* var., Wilts." A cursory examination was sufficient to show me that the shells were not what they pretended to be, and that a mistake had been made. I suspected them to be *Eulota fortunei* Pfr., an oriental species, an identification since kindly confirmed by Mr. G. K. Gude, who refers them to the var. *meridionalis* Mlldff. Accidentally included in the same tray is an example of *Ariophanta lævipes* (Müller). The mistake is an extraordinary one! I do not think for a moment that Mr. Rippon could have had any desire to impose on his friends, but with such a mass of material under his care it is possible that his memory played him a trick, or more likely still, that he accepted the record of another collector in good faith. *Eulota fortunei* Pfr. var. *meridionalis* Mlldff. might have a great superficial resemblance to a sinistral *Theba cantiana*, but it would be seen to differ materially in the striation and in the narrow open umbilicus. Mr. Rippon corresponded largely, and amassed a collection of exotic insects and shells, comprising nearly a quarter of a million specimens. It is not surprising, therefore, to find other specimens on record, received in all probability by exchange. Canon J. W. Horsley has had a specimen for years, and has very kindly sent this to me for comparison. This shell agrees exactly with those in the Rippon Collection. Mr. G. K. Gude has also a specimen which he got from a dealer in 1895, said to have been found in Dorset, but he now says that this shell is also identical with those in the Rippon Collection. There remains only Mr. J. W. Taylor's shell, but as this came originally from Mr. Rippon's Cabinet, the deduction is obvious.—J. DAVY DEAN, National Museum of Wales (*Read before the Society*, December 11th, 1918).

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[1] *Journ. of Conch.*, vol. vi, p. 33; see also Taylor's *Monograph*, vol. iv, p. 92.

BRACHYPODELLA OROPOUCHENSIS, nov. sp. FROM TRINIDAD, W.I.

By GEO. C. SPENCE.

(Read before the Society, January 8th, 1919).

PLATE I.

Cylindrella trinitaria — Urich in " Journal of Trinidad Fi
Naturalists' Club," no. 9 (August, 1895), vol. 2.

Shell dextral, cylindric below, the upper third tapering to moderately wide truncation; solid but thin, darkish horn-colour and somewhat shining between the fine, regular, arcuate and wi spaced whitish riblets (which are about ·3 mm. apart)—the interv being five or six times the width of the riblets. Whorls remaini fourteen, the lower three or four flattened arcuate and shoulder upper whorls rather strongly convex. Suture impressed and occasi ally infringed upon by the ends of the riblets. Last whorl strong keeled below and serrated by the riblets; these become slightly m crowded on the curved descending neck which has a sulcus on t outer side above the keel and which extends about half-way round t body whorl. Aperture oblique, tetragonal-rounded, angular at t outer and basal margins and perceptibly flattened on the out posterior side. Peristome white and broadly expanded. Axis stro sinuous and encircled by a strong smooth lamella, having a thicken and rounded edge, gradually increasing from the upper whorls un in the fourth from the base it reaches the greatest development a then dwindles away more rapidly. Apex ?

Length 16·5 mm.; breadth 2·5 mm.

Habitat Forest on banks of Oropouche River, Trinidad.

"The forest here is very dense and damp and right through t woods are scattered upheavals of tremendous boulders of crystalli limestone on which are to be found the shells *Cylindrella trinita* by the hundred hanging to the dry sides of the boulders."—Urich.

Through the kindness of Mr. Fred Taylor I recently obtained a fe shells collected by Mr. Urich on March 3rd, 1895, and sent by hi to the late Wm. Moss as *C. trinitaria* (Pfr.), which up to now is th only Brachypodella recorded from Trinidad. The species belong apparently, to the section Brachypodella s. str. as defined by Pilsb in the " Manual," vol. xvi., page 64, and it is remarkable that it ha been overlooked or confounded for so long with *B. trinitaria* (Pfr from which it varies in many points, *e.g.*, size, contour, more wide spaced riblets and axial structure.

Figures nos. 1, 2, and 3 are from photographs kindly taken by M

J. W. Jackson. Type in my collection. Co-type in Manchester Museum.

It is only fair to add that when receiving the shells Messrs. Taylor and Moss both noticed that they differed from *trinitaria*.

◆ ◆ ◆

TROPIDOPHORA STANDENI nov. sp. FROM MADAGASCAR.

By GEO. C. SPENCE.

(Read before the Society, March 12th, 1919).

PLATE I.

SHELL thin but strong, narrowly but deeply umbilicated, general form as figured, somewhat shining. Apical whorls smooth, brown fading to whitish on the upper portions of the whorls. Remainder milk white with slightly oblique brown streaks across the whorls, the colour being more accentuated on the encircling keels to which a beaded appearance is imparted. Whorls 5½, convex with extremely fine incremental striæ and, excepting the apex, encircled with numerous strong raised keels (of which there are twelve on the body whorl, including those visible within the umbilicus). Last third of body whorl slightly and regularly descending. Aperture circular, interior yellow tinted, fading to bluish in the throat, external keels showing through as white lines. Corrugated within. Peristome thin, broadly expanded, reflexed and crenulated at the edge. Outer posterior portion with a large expanded notch while the columella expansion threequarter covers the umbilicus. Margins connected by a thin transparent callus. Operculum normal.

Altitude, 27·5 mm.; maj. diam. 26·5 mm.

Habitat Madagascar.

This species, the unique type of which is in my collection, resembles *Tropidophora creplini* Dkr., but is much larger and has in addition the broadly expanded peristome described above with the curious notch which calls to mind that found in *Eutrochatella regina* Morelet.

It is with much pleasure that I couple with this fine shell the name of Mr. Robert Standen, who has for many years been my unfailing friend and guide in conchological matters, as a slight acknowledgment of his many kindnesses. In conclusion I wish to thank Mr. J. C. Melvill and through him, Mr. H. C. Fulton, for the trouble taken and opinions kindly expressed, and also Mr. J. W. Jackson for having been so good as to take the accompanying photos.

FIELD NOTES ON HELICODONTA OBVOLUTA Müller.

(Concluded from p. 36).

BY H. BEESTON.

(Read before the Society, February 14th, 1917).

In his Manual, page 59, Mr. L. E. Adams says "I have seen young sinistrorse specimen in the possession of Mr. W. Heathcote, Preston, which is said to have come from Mitcham in Surrey." this record can be relied on as to locality, then the range of *H. obv luta* is much extended, and includes a portion of the North Downs hence it is quite possible that if diligent search were made in th wooded districts of the North Downs and the intervening country the shell might be found in suitable places. The sinistrorse specimen was discovered in a tube containing shells of *H. obvoluta.* purchased in April, 1891, at Stevens' Rooms, but no further information regarding them is forthcoming, except that the tube was marked "Mitcham, Surrey." I am of opinion that Mitcham is a misprint fo Ditcham.

There are two other records from the North Downs, viz., one from Norbury Park, near Dorking, Surrey, stated on the authority of Mr. Charles Pannell (vide *Journ. of Conch.*, vol. 10, p. 332), and the other from Druids' Grove, also near Dorking, recorded by Mr. K. McKean (vide *Journ. of Conch.*, as above).

Up to the present the most southerly point of its range is Wood End, at the foot of the South Downs, a mile north of West Ashling, Sussex. The late Mr. Wm. Jeffery recorded it from this place, which is less than 200 feet above sea-level, and not more than three miles from the sea. Only dead shells were obtained. Living specimens I have myself taken from a small beech hanger (William Wood) near the village of Stoughton, Sussex. I am indebted to Mr. Jeffery's son, himself a keen naturalist, for the exact localities named above.

In *Journ. of Conch.*, vol. 3, p. 316 ("Mollusca of Western Sussex") I note that under *H. obvoluta* Mr. Jeffery says: "I have occasionally found dead shells for the last ten years on a bank at Woodend, at the base of the Downs, but no living specimens, even after many careful searches during that period, so that I conclude it has died out—it may have been introduced there."

It seems very plausible that the range of the species southward and westward was at one time and may even now be very much more extensive than is generally supposed; probably it inhabited that very extensive tract of country known as the Forest of Bere, which stretched from the confines of, and joined up to the Weald on the east, to the north-eastern limits of the New Forest on the west ; but as the shell has never been recorded from the New Forest, it is very probable that it was confined strictly to the chalk areas.

It is a well known fact that many species of snails indulge in the habit of climbing trees in spring, and this predilection has led some to believe that *H. obvoluta*, in common with *H. lapicida*, *Ena obscura* and *E. montana*, ascends the trees to a great height and remains there all the summer, only descending in autumn to deposit its eggs and to hibernate.

Mr. E. W. Swanton (Zoologist, Aug., 1915) refers to this habit as follows : "To secure living specimens it is necessary to visit the trees at the time of the spring ascent or the autumn descent," and very definitely states that the animals are in the habit of "ascending the trunks in spring upon emergence from hibernation, and spending the summer on the branches." Once only have I seen *H. obvoluta* ascending trees, and that was on a very mild wet day in early April. On that occasion I observed about a dozen snails at the height of about five feet from the ground, but they had then finished the climb. They had evidently left their hibernaculum a short time before, lured out by the mild and humid atmosphere, and were doubtless in search of suitable food. This is the greatest height I have ever observed the snails up the trees. I do not positively say they do not climb somewhat higher, but that they mount the trees in spring and spend the summer on the branches requires definite proof. On one or two occasions I have seen *H. lapicida* six or seven feet up the trees, but rarely higher. *E. obscura* certainly climbs higher, but I am not aware that there is any evidence that *H. obvoluta* attains very great elevations and remains there all the summer. I have on several occasions collected *H. caperata*, *H. heripensis*, *H. virgata*, *H. striolata*, *H. aspersa*, *H. nemoralis*, and *H. hortensis* several feet up the bare trunks of the beeches, but I do not think any conchologist would be bold enough to say that these species remain up the trees all the summer. The greatest objection to the theory is the fact that *H. obvoluta* begins laying eggs in May. There is one other objection ; it is that *H. obvoluta* is to some extent a moisture-loving creature, and somewhat subterranean and nocturnal in its habits. If it does reside aloft in summer, and the weather should become droughty, the animal naturally retreats into its shell, and the first gusty day would soon bring it to the ground, as the very slender power of adhesion it possesses would be insufficient to hold it to the swaying branches. *H. obvoluta*, too, has the habit in dry weather of forming its chalky

Mr. J. W. Taylor in his Monograph states that it is found fossil in the Pleistocene gravels of Grantchester.

Mr. A. S. Kennard vouches for the finding of an immature specimen at Barrington, in Cambridgeshire, in the same geological formation about two years ago.

Variation.—

The species seems to vary very little except in size. The largest specimen I have measures 14 mm. in diameter; the smallest 11 mm.

Albinos are unknown in this country, and monstrosities are practically absent, only one specimen of a sinistral shell being recorded, the original locality for which is somewhat enigmatical.

List of Recorded Stations.—

I.—HAMPSHIRE (East). Locality.	Recorder.
Crabbe Wood, near Winchester	J. R. le B. Tomlin.
Alresford Woods „ „	H. J. Bellars.
Stoner Hill, near Petersfield	Gwyn Jeffreys.
Steep „ „	Charles Ashford.
Ashford Wood „	„ „
Liss „ „	C. Stanley B. Cox.
Ditcham Wood „	Dr. James Lindsay
Buriton Hanger „	„ „
Miscombe Hanger „	H. Beeston and C. Wright.
II.—SUSSEX (West).	
Up Park	Wm. Jeffery.
William Wood, near Stoughton	Geo. Jeffery.
Wood End, near Funtington	Wm. Jeffery.
Kingly Vale „ „	„ „
Wood near Pen Hill	C. Reid.
Phyllis Wood, near Treyford	Mr. Houseman.
Rook Clift „ „	C. Reid.
Didling Hanger	„
Bepton Down	„
Winden Wood (hazel copse)	„
West Dean Woods	Wm. Jeffery.
Charlton Forest	„ „
Heyshott Hanger	E. W. Swanton.
Graffham Woods	C. Reid.
Fryar Hanger	„
Woolavington Hanger	„

Barlavington Hanger	C. Reid.
Duncton Hanger	„
[1] Glatting Hanger, Sutton	„
Farm Wood, Sutton	„
Bignor Hill	„
Spring Head, Storrington	W. Borrer.

III.—SURREY (South-west).—

Norbury Park	S. J. da Costa.
Druid's Grove	Kenneth McKean.
Mitcham, sinistral specimen.	Finder unknown.

As possibly very few have had the opportunity of seeing Dr. James Lindsay's article on his discovery of *H. obvoluta* at Ditcham Wood, nearly a century ago, I append a transcript of the paper, kindly supplied me by Mr. J. W. Jackson, from Transactions Linnean Society, xvi, 765 :—

> *March 1st, 1831*. Read the following letter from Dr. James Lindsay, addressed to Roderick Impey Murchison, Esq., F.R.S., etc., giving an account of the *Helix obvoluta* Lam. being found apparently indigenous in Hampshire.
>
> "SIR,—Last May, when searching for land shells, I was surprised to meet with the *Helix obvoluta*, hitherto considered a foreign species, and, I believe, never before noticed in Great Britain.
>
> "I discovered it, along with other *Helices*, such as *Helix nitida* and *rufescens*, amongst the moss near the roots of trees in Ditcham Wood, near Buriton, Hants. This shell is found for a considerable distance along the chalk escarpment of the South Downs, facing to the north ; and although more rare than the other species above mentioned, I have collected above twenty individuals.
>
> "Lamarck describes the French shell as having the margin of the lip white ; but in the Hampshire specimens, when fresh, that part is tinged with red. Lamarck takes no notice of the smooth tooth-like processes on the inner-side of the lip, which in this species are always present. The aperture is triangular ; the mouth a little reflected, forming a distinct sinus internally, and in every other respect answering to the Lamarckian description.
>
> "Should you consider these observations worthy of the notice of the Linnean Society, I shall feel gratified in your presenting them.
>
> I am, your most obedient servant,
>
> JAMES LINDSAY.
>
> *10th Nov., 1830*.
> Nursted House, near Petersfield."

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[1] Also found on a damp shady roadside bank among ivy and mixed hedgerow shrubs (no beech) near Sutton (Stelfox).

Since writing the above article a very interesting piece of information has been[1] published by Kennard and Woodward regarding the discovery of *H. obvoluta* in Britain, questioning the priority of Dr. Lindsay's original discovery.

In vol. 4, pp. 302–3, of a "Natural History," by Dr. R. Brookes, published in 1768 (London) occurs the following interesting description of a shell which they believe refers to *H. obvoluta.*

> "The *whitish depressed* snail with a *dentated mouth* is about half an inch broad, and its height no more than the third of an inch. It consists of three or four spiral turns, and has a flat clavicle. The mouth is about a quarter of an inch long, and almost as much broad, which makes the figure nearly roundish. It has a pretty broad lip and pearly white, and is slightly dentated on each side. The colour of the whole shell is whitish, without any variation. It is said to be met with in *Charlton Forest* in *Sussex*, and is pretty common in Italy."

If this description refers to *H. obvoluta*, and in some degree it corresponds, then Dr. Lindsay's record is anticipated by more than half-a-century. Unfortunately neither scientific name nor recorder is given. The italics are in the text.

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Spirula peroni Lamarck **in North Devon.**—Between August 16th and Sept. 5th of this year I collected fifteen of the shells of this Cephalopod on the sands of Croyde Bay and Pulsborough, which lie on either side of Baggy Point, situated four or five miles below Mort Ho! They had been carried far up the beach, generally to high-water mark, and were as a rule in good condition. A vast number of a species of *Velella*, a member of the Siphonophora, was thrown up at the same time. These beaches are not generally rich in shells, except for a vast number of *Mactra stultorum* Linné in good preservation, often in fact alive. Patches of coal dust, often so rich in small species, usually only yielded a large quantity of broken bivalves, which it was impossible to recognise. I have examined these beaches during August and September, during the present and past years, and the only other species found in any numbers were *Teredo megotara* Hanley in a log, *Scala clathrus* Linné, *Clathurella purpurea* Montagu, *Actæon tornatilis* Linné, and *Natica catena* Da Costa. The rock collecting, too, was poor, probably owing to the fact that most of the depressions in the rocks do not run parallel to the sea, but allow its full force to rush up them. This year there was a very large number of *Lepas anatifera* cast up, also many other Crustacea. I am inclined to think that great submarine and anti-submarine activity may have had something to do with this. Might this not be the case also with *Spirula* and *Velella*?—ALAN GARDINER (*Read before the Society*, November 13th, 1918).

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[1] Proc. Malac. Soc. Lond., xiii., 88.

OCCURRENCE OF HARTMANNIA SEPTEMSPIRALIS (Razoumovsky) AND H. PATULA (Drap.) IN ENGLAND.

BY H. C. HUGGINS.

(Read before the Society, November 13th, 1918).

WHILE searching for shells near Dover in late September this year I found among moss on a wall at Kearsney a number of small shells I took in the bad light (it was almost dark at the time) to be *Ena obscura.* Directly I got into the train, however, I glanced at my captures and saw among the *obscura* several small operculate shells quite unknown to me. By reference to Messrs. A. W. Stelfox and A. S. Kennard I found that these were four examples of *Hartmannia septemspiralis* (Razoumovsky) and three of *H. patula* (Draparnaud). I could not revisit the locality for almost a month and as several slight frosts had intervened I did not hope to find any more, but, after careful searching I succeeded in getting three more examples of *septemspiralis* and one of *patula.*

Had the specimens all been of one species, and all *septemspiralis,* I might have thought that they were native shells, as owing to their diminutive size and habit of living in moss at the base of walls they might easily have been overlooked, for *septemspiralis* has a wide continental range, reaching as far north as Bavaria, Alsace, Finisterre and Pas de Calais; but the occurrence of a species with such a purely southern range as *H. patula* causes me to regard them both as imported, probably deliberately. I fancy they have been in the locality more than a year, as I found what was apparently an oldish dead shell and also a half-grown example of *septemspiralis,* and as I had not visited the locality where I found them for several years they may quite easily have been there some time; also, I do not usually look twice at any shell like *Ena obscura* and so may have passed them before.

Both species are about the same length as *Ena obscura,* but can be distinguished very easily by their acutely pointed spires, deep sutures, operculate mouths, and the markedly excentric placing of the mouth, which projects far beyond the outer lines of the shell. *H. septemspiralis* is of a red and yellow colour, like South Devon *H. lapicida,* and deeply striated; *H. patula* olive grey and very lightly and smoothly striate.

It is a noticeable fact that since the opening of the various East Kent coal borings, on which a large number of foreign workmen have been employed, species previously overlooked or non-existent in this part of the country like *Hygromia umbrosa* (Margate), *Clausilia dubia* (Dover Castle), and now *H. septemspiralis* and *H. patula* (Kearsney) have turned up, and it may be that they have been deliberately introduced. I have not adduced *Helicella elegans (terrestris)* in support of this theory as it was found, I believe, before the days of coal boring, and *Eulota fruticum*, another Lydden species, has also been found in localities so far away that it must be cleared from this suspicion. On the other hand it seems quite possible that some reader of Mr. Maurice Hewlett's romances may be going over the county, à la Senhouse, acclimatising snails instead of plants, and, if so, I hope he will communicate with me and save me the trouble of recording his foolish exploits.

As Mr. Kennard has pointed out, however, this part of the country round Dover is the home of several plants found nowhere else in the county, so it may be that species with a restricted range are found with them, but before introducing such shells as *H. septemspiralis* and *H. patula* as natives some proof of a wide local range appears to be necessary.

My thanks are due to Messrs. A. W. Stelfox and A. S. Kennard for the identification of my shells, and to Messrs. A. S. Kennard and J. R. le Brockton Tomlin for the generous gift of continental examples of both species for purposes of comparison.

Zonitoides nitidus var. **viridescens** Cockerell **in North Staffordshire.**—Five specimens of the rare greenish variety of *Zonitoides nitidus* were taken under a log amongst reeds and rushes on the edge of a disused stretch of the Trent and Mersey Canal, between Oakamoor and Froghall, in May of this year. A short distance away the type occurs, but very sparsely, only three immature specimens being taken.—W. E. ALKINS (*Read before the Society*, June 12th, 1918).

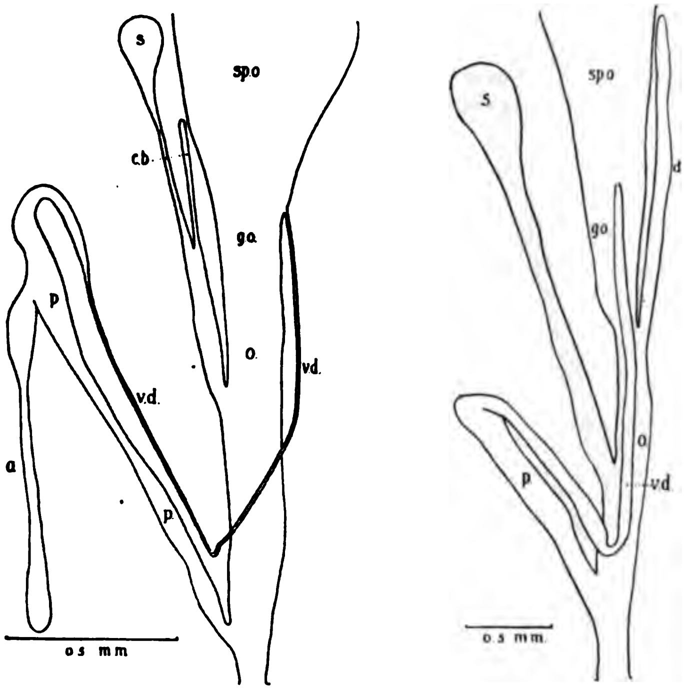
A Scalariform Planorbis carinatus Müller.—In a backwater of the Trent and Mersey Canal, near Consall Mill, Staffordshire, a very scalariform example of *Planorbis carinatus*, young, was taken on June 1st, 1918. In addition to the following species:—*Pl. carinatus* Müller, *Pl. corneus* Linné, *Pl. vortex* Linné, *Limnæa stagnalis* Linné, *Acroloxus lacustris* Linné, and *Valvata piscinalis* Müller, all of which were present in great numbers on the reeds, an unusually large form of *Physa fontinalis* Linné was also taken in some abundance.—W. E. ALKINS (*Read before the Society*, June 12th, 1918).

THE GENITALIA OF AZECA TRIDENS AND COCHLICOPA LUBRICA.

By A. E. BOYCOTT.

(Read before the Society, February 14th, 1917).

There seems to be some doubt about the morphology of the lower genitalia in these two species. I give here a drawing derived from recent observations. Gross dissection has in each case been checked by serial microscopical sections; the figures have actually been reconstructed from the latter.



C. lubrica. *A. tridens.*

sp.o., spermoviduct; g.o., glandular oviduct; o., free oviduct; v.d., vas deferens; p., penis; a., appendix to penis; d., diverticulum of oviduct; c.b., copulatory branch of duct of spermatheca; s., spermatheca.

The actual, not the superficial, origin of the vas deferens is indicated.

1.—**Azeca tridens.**—The vas deferens is remarkably bulky throughout its course, and the walls muscular even in the descending limb, which runs in relation with the oviduct. The ascending limb is really penile in character, and it is hard to fix any point, unless it be at the bend below, where the vas becomes the penis. Arising from the free oviduct, immediately below the beginning of the glandular portion, is a long diverticulum with thin walls, which runs up closely adherent to the spermoviduct, ending blindly above.

2.—**Cochlicopa lubrica.**—The penis is furnished with a large appendix, the proximal third of which has highly muscular walls; the lower two-thirds of the penis, from the origin of the appendix to its junction with the oviduct, is a simple non-muscular tube. The duct of the spermatheca has a small copulatory branch. My results correspond with those of C. M. Steenberg[1] and Moquin-Tandon,[2] except that the latter does not show the copulatory branch; they do not agree at all with Ihering's figure, which is reproduced by J. W. Taylor.[3]

I am much indebted to Mr. Charles Oldham for *tridens* material from Berkhamsted; the *lubrica* examined were from Aldenham.

◆

Parthenogenesis in Paludestrina jenkinsi.—The absence of male individuals and of any male anatomical elements in this interesting species has been noticed already (this *Journal*, vol. xv (1917), p. 216; *Trans. Herts. Nat. Hist. Soc.*, vol. xvi (1917), p. 276). I now have evidence that parthenogenetic reproduction actually occurs. In September, 1915, a number of the snails were put in a small aquarium; many were afterwards used for anatomical examination and were all found to be females; the remainder lived comfortably, and ultimately produced young ones, which were first noticed in November, 1916. On 1st January, 1917, three minute individuals, about a millimetre long, were isolated, each in a separate jam jar, with some sprigs of *Elodea* from a well-searched pond which is more than two miles from any known locality for *jenkinsi*. The jars had glass lids, and were never cleaned out, nor was any fresh water or anything else put .in at any time. One of them was broken, and circumstances over which I had no control prevented any continuous observation of the others. But I find on 1st August, 1918, that each contains about twenty *jenkinsi*, from infants to about half-grown, and I can see no way out of the conclusion that these have arisen from the single individuals which were put by themselves shortly after birth. [Further progress has since been made. On 1st August, 1918, four more very young individuals were isolated in the same way: A and B from the first parthenogenetic broods; C and D from the original aquarium. In March, 1919, all four were about full-grown, and on 8th April, 1919, I found a brood of young ones in B. The mother was then killed and examined by a complete series of microscopical sections, without finding any male organs or spermatozoa. We have, therefore, two successive parthenogenetic generations. D produced a brood in May, and C in June. The parent D was examined and found to be wholly female].—A. E. BOYCOTT (*Read before the Society*, Sept. 11th, 1918).

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[1] *Danmarks Fauna: Landsnegle*, 1911, p. 181, fig. 152.

[2] *Histoire naturelle* (1855), vol. ii, p. 306, pl. xxii., fig. 17.

[3] *Monograph*, vol. i (1900), p. 356, fig. 650.

SINISTRAL LIMNÆA PEREGER Müll. AND ITS PROGENY.

By J. A. HARGREAVES.

(Read before the Society, September 13th, 1916).

For fifteen years a pond near Leeds has been known to yield occasional sinistral specimens of *L. pereger*. As far as I have been able to learn they have occurred with fair regularity through successive seasons, though probably more abundant at one time than another. I am inclined to think that in 1916 they were unusually common, as in several visits my friends and I got a fair series.

In addition to *L. pereger* the following species occur in the pond:—

Vivipara vivipara	common
Planorbis corneus	common and large
P. umbilicatus	common
P. albus	rather scarce
Limnæa stagnalis	common
Sphærium corneum	common

I have not obtained sinistral forms of any species except *L. pereger*, nor can I ascertain that any have ever been found there.

I thought it would be a useful experiment to hatch out several series of eggs from both sinistral and dextral parents and tabulate accurately the results.

One serious drawback to the experiment was that the character of only one parent was known. In two or three cases specimens were taken in copula, but always with a dextral mate, whilst the fact that in the pond itself probably over one per cent. and under two per cent. of the *L. pereger* are sinistral shows that in the great majority of cases one parent would necessarily be dextral. It is, however, quite possible that in some cases both parents might be sinistral. When the *Limnæa* were obtained, the sinistral specimens were at once isolated in a separate jar. Several soon deposited eggs on the *Elodea canadensis* which was placed in the jar with them, and which was obtained from the same pond. The *Elodea* was most carefully scrutinised, to be certain that there were no eggs on it, before it was placed in the jar.

The batches of eggs as laid were placed in separate glass jars or saucers to hatch. A second drawback to the experiment was that the jars had to be left unattended, some in Leeds, some in Scarborough, for several days at a time. Possibly this affected the numbers of young hatched, as the water was not changed so frequently as desirable, and in such small receptacles it is apt to become foul. The proportionate results would hardly be affected.

Incidentally it is worthy of note that the periods of incubation v considerably. The Scarborough specimens, placed in a bow wi so as to get a maximum of light and heat, hatched sooner by s days than those kept in Leeds. The latter were placed n window, but subject only to diffused light, and never to sunlight.

Another difference noted is the smaller number of young obt in Leeds as compared with similar batches hatched at Scarbor My friend Mr. Stephenson, of Leeds, hatched out three batcl eggs, numbers 41, 42, 43, the results of which he has kindly al me to add to my lists.

For convenience of reference I have placed together the r from sinistral parents omitting those from dextral parents.

Nos. 11, 21, 25 and 31 were infertile, and the egg masses gra decayed. Nos. 14 to 20 and nos. 23, 24, 27, 28 and 32 were dextral parents and the results from these are not given in detail

NO. OF RECEPTACLE.	RESULTING YOUNG.	
	DEXTRAL.	SINISTRAL
1	40	0
2	51	0
3	0	13
4	3	36
5	0	8
*6	33	34
7	115	0
8	68	1
9	86	1
10	118	0
12	16	1
*13	15	19
26	13	0
29	0	22
30	22	0
33	14	3
34	24	0
41	25	0
42	38	0
43	25	0
TOTAL ...	696	138

* See note later.

No. 6 receptacle contained two batches of eggs together. When first observed the sinistral examples were larger than the dextral, and probably hatched out a day or two earlier from one of the masses of eggs, and the smaller dextral ones from the other mass, as I have not noticed that sinistral shells grow faster than dextral immediately after being hatched.

No. 13 consisted of several broken masses of eggs, from several sinistral parents.

The results totalled are

696 dextral and 138 sinistral.

Clearly the result shows that dextralism is "dominant."

Does not this result also tend to show that this particular monstrosity produces approximately the same results as varieties under Mendelian laws? The proportions are rather different but not widely so. More experiments are required to correct or confirm these results, as they are too few to be available for safe generalisation.

It is interesting to note that though the egg masses were approximately of the same size, those resulting in "pure" sinistrals yielded much smaller numbers of young than the "pure" dextrals, the maximum being 22 as compared with 118.

All the egg masses obtained where the only known parent was dextral, yielded dextral young only, not a single sinistral example being obtained from them. It is quite probable that the ancestors of the selected examples may have been dextral for generations. Possibly it may indicate that the tendency to this monstrosity exists only in certain strains in the pond, and possibly even that the monstrosity is transmitted only through sinistral forms, but many more batches would have to be examined before one could arrive at a definite conclusion.

It would be interesting to continue the observations through another generation from

(1) The dextral forms deriven from a sinistral mother.
(2) The sinistral forms from a sinistral mother.
(3) Crosses between the two.

Since this was written, Mr. Bevan, of Scarborough, has hatched eggs from a dextral individual which I gave him, and amongst the young were three sinistral specimens.

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NOTES ON LIMNÆA PEREGER m. SINISTRORSUM.

By W. HARRISON HUTTON.

(Read before the Society, September 8th, 1915).

I HAVE always found it difficult to keep *Limnæa pereger* alive for any length of time in confinement, never over five or six months, excepting in the case of young specimens, which seem to become more accustomed to their surroundings and in some cases have lived longer. This refers to the type, but m. *sinistrorsum* seems more delicate, and adult specimens that I have placed in an aquarium, with one or two exceptions, have only averaged about a month or two of life.

Another sign that they are not so robust is that their shells are more fragile than shells of the type taken out of the same habitats.

On April 26th I isolated two specimens of *L. pereger* m. *sinistrorsum* that had been in copulation with typical *pereger* (dextral). In all cases that have come under my observation, about a dozen, the pairing is always one of the type with a *sinistrorsum*, never two *sinistrorsum*, which I do not think would be possible.

On May 5th I observed the *pereger* extruding egg-sacs, and by May 13th they had deposited four egg-sacs in each of which I counted from 250 up to 300 embryos. On May 14th I noticed that one of the egg-sacs had become of a light amber tint, though they were all transparent and colourless when deposited; it was also surrounded by a green alga. This never came to anything, and the embryos rotted away. The sacs had all by this time become much larger, in some cases measuring 34 mm. in length and 8 mm. in diameter. One of the *pereger* died during the extrusion of an egg-sac.

On June 30th as the young fry had now left the egg-mass, which had broken up and had become larger, I counted them with a lens, and found them to number 50 per cent. *sinistrorsum* and 50 per cent. type. A week afterwards, as they were dying off very rapidly, I removed them to a pond, where there was no sign of *pereger* and the habitat looked very suitable; but although I visited it once or twice for two or three years I never saw anything more of them.

The parents, as in all cases that have come under my observation, died shortly after depositing the egg-sacs.

After eight years of observation of the habitats of the *L. pereger* m. *sinistrorsum*, I come to the conclusion that their appearance and almost total disappearance at different periods is the effect of the law of periodicity, and that every third year they are most numerous, though never very numerous at any time. I am afraid they are now extinct in one of the habitats.

I have never yet found a specimen of *L. pereger* m. *sinistrorsum* or heard of any records of finds on a limestone formation; apparently the most favourable habitat is a clay soil or sandstone formation; a pond with a clay-mud bottom, and *Elodea canadensis*, *Callitriche verna*, *Lemna minor* and *L. trisulca* for vegetation. Its molluscan associates are *Limnæa auricularia*, *Planorbis corneus*, *P. umbilicatus*, sometimes *P. carinatus*, *P. spirorbis*, and *L. stagnalis*, which is believed to be detrimental to the increase of most other mollusca in a pond. In one habitat I have found it in association with *Vivipara vivipara*.

From frequent observations and examination of habitats where abnormal specimens occur, I believe soft water is most favourable to the formation of abnormal freshwater shells. Mr. J. W. Taylor, in his valuable Monograph, vol. i, p. 104 and p. 114, illustrates specimens of *P. carinatus* m. *sinistrorsum*, and other forms, from Leventhorpe Pastures, near Leeds, a habitat I have often visited. This stream is of soft clay water, and is largely fed from the warm exhaust of a pit-engine; in that habitat abnormal shells were more frequent than normal.

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On a Colony of Cochlicopa lubrica Müller.—It may be worth recording that while on a ramble in East Knighton Wood, on the south side of Ashey Down, near Brading, in the Isle of Wight, last August, I came somewhat unexpectedly on a colony of *Cochlicopa lubrica* on the trunk of a good-sized beech. The molluscs, about fifty in number, present a departure from the usual colouration of the species, all of them tending more or less towards the form known as the var. *hyalina*. Though only seven could strictly bear the name of that variety, the others were nearly all very pale in hue. The snails were attached to crevices in the bark, and some reached up as high as five or six feet from the ground. Though it is not unusual to discover this species on beech trunks, I never before met with so large a colony. The most notable feature about the habitat was that the surrounding ground was entirely devoid of green vegetation, so that apparently the molluscs were compelled to find their sustenance on the bark which was thinly coated with lichen and at the base with a little moss. Two or three *Helix rotundata* with somewhat eroded tests, which gave them a patchy-white appearance, were found on the undersides of fallen pieces of bough lying on the ground within the circuit sheltered by the outspread limbs of the beech tree; but no *C. lubrica* were to be found anywhere but on the main tree-trunk itself. It would seem that this colony of white or whitish *C. lubrica* may be due to the peculiar features of its habitat, its isolated position limiting and restricting the range of its feeding ground to the scanty vegetation on the tree-trunk.—S. SPENCER PEARCE (*Read before the Society*, Oct. 13th, 1917).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

477th Meeting, held at the Manchester Museum, Dec. 11th, 1918.

Mr. R. Standen in the chair.

Donations to the Library announced and thanks voted :—

"Manual of Conchology," part 97, by H. A. Pilsbry *(presented by the author).*

"Shells as Evidence of the Migrations of Early Culture," by J. Wilfrid Jackson *(presented by Mr. Edward Collier).*

New Member Elected.

T. O. Bartlett.

Candidate Proposed for Membership.

Taswell Edward Belcher, "Trefloyne," Sandringham Road, Parkstone, Dorset (introduced by Edward Collier and J. Wilfrid Jackson).

Members Resigned.

E. Arnold Wallis and Sydney Ash.

Member Deceased.

The Rev. Canon Alfred Merle Norman, F.R.S.

Paper Read.

"Unauthentic Records of *Theba cantiana* (Mont.) monstr. *sinistrorsum* in England," by J. Davy Dean.

Exhibits.

By Mr. R. Standen : *Helix aspersa* killed and expanded by a new and improved method.

By Mr. J. Ray Hardy : *Cochlicopa lubrica* and var. ; also five white examples of *Pyramidula rotundata* from Gatley Carrs, Cheshire.

In the Special Exhibit *Tellina*, large series were shown by Messrs. C. H. Moore, J. G. Kitchen, J. Ray Hardy, Mrs. Gill, and the Manchester Museum.

It was decided to have the following Special Exhibits :—

January 8th - -	British *Purpura.*
February 12th - -	British *Littorina.*
March 12th - -	British *Ena* and *Balea.*

478th Meeting, held at the Manchester Museum, January 8th, 1919.

Mr. R. Standen in the chair.

New Member Elected.

Taswell Edward Belcher.

Candidates Proposed for Membership.

James A. Grieg, Curator, Bergen Museum, Bergen, Norway.

O. Nordgaard, Director of the Biological Station, Trondhjem, Norway (both introduced by H. Schlesch and J. W. Jackson).

John Hugoe Matthews, 6, York Road, Chorlton-cum-Hardy, Manchester.

Arthur Tindell Hopwood, 9, Stamford Road, Chorlton-cum-Hardy, Manchester (both introduced by J. W. Jackson and R. Standen).

Paper Read.

"*Brachypodella oropouchensis* sp. nov., from Trinidad, West Indies," by G. C. Spence.

Principal Exhibits.

By **Mr.** G. C. Spence: Species of *Brachypodella* to illustrate his paper.

By **Dr.** W. T. Elliott: An immature specimen of *Helix caperata* m. *scalariforme* from Jersey.

In the Special Exhibit of "British *Purpura*," series were shown by Messrs. C. H. Moore, J. W. Jackson, R. Standen, Mrs. Gill, and the Manchester Museum (coll. R. D. Darbishire).

ACCOUNTS FOR YEAR ENDED DEC. 31st, 1918.

INCOME AND EXPENDITURE ACCOUNT.

INCOME.		£	s.	d.
To Balance from Account for 1917		6	10	11
,, Annual Subscriptions :				
For 1918— 193 at 5/0	48 5 0			
Arrears— 97 at 5/0	24 5 0			
		72	10	0
,, Sale of Publications ...		22	9	2
,, Donations towards Cost of Illustrations		3	12	3
,, Advertisements		3	0	0
		£108	2	4

EXPENDITURE.		£	s.	d.
By Publishing and Distributing *Journal of Conchology* :				
Vol. xv., pt. 8	16 10 2			
,, ,, 9	19 3 2			
,, ,, 10	33 5 1			
		68	18	5
,, Authors' Reprints ...		4	1	0
,, Printing and Stationery...		1	10	6
,, Fire Insurance		0	10	0
,, Subscriptions :				
Malacological Soc.,	10 6			
Lancs. and Ches. Fauna Comm.	5 0			
		0	15	6
,, Officers' Expenses :				
Secretary ...	3 4 0			
Treasurer ...	1 0 3			
Editor	0 13 4			
		4	17	7
,, Transfer to Life Membership Fund		20	0	0
,, Balance, being excess of Income over Expenditure		7	9	4
		£108	2	4

LIFE MEMBERSHIP FUND.

	£	s.	d.
To amount of Fund on Jan. 1st, 1918...	18	18	0
,, Two Composition Fees at £3 3 0	6	6	0
,, Dividends on National War Bonds	0	14	9
,, Transfer from Income and Expenditure Account ...	20	0	0
	£45	18	9

	£	s.	d.
By amount of Fund on Dec. 31st, 1918	45	18	9
	£45	18	9

BALANCE SHEET.

LIABILITIES.	£	s.	d.	*ASSETS.*	£	s.	d.
Annual Subscriptions paid in advance:				Annual Subscriptions for 1918:			
1919, 17 at 5/0, 4 5 0				Outstanding, 41 at 5/0, 10 5 0			
1920, 1 at 5/0, 0 5 0				Estimated to produce ...	6	3	0
1921, 1 at 5/0, 0 5 0				5% National War Bonds ...	45	0	0
	4	15	0	Cash at Bankers and in hand	13	3	1
Recorder's Expenses (estimate)	1	2	0				
Life Membership Fund ...	45	18	9				
Balance of Income and Expenditure Account ...	7	9	4				
Balance, being excess of Assets over Liabilities ...	5	1	0				
	£64	6	1		£64	6	1

NOTE.—Assets in addition to those set out in the Balance Sheet are :—(*a*), Library; (*b*), Cabinets and Collections; (*c*), Stock of Unsold Publications; (*d*), Annual Subscriptions in arrear prior to January 1st, 1918.

CHAS. OLDHAM, *Hon. Treasurer*,
Dec. 31st, 1918.

Audited and found correct,
C. H. MOORE,
E. RIDSDALE BROWN.
January 4th, 1919.

479th Meeting, held at the Manchester Museum, February 12th, 1919.

Mr. B. R. Lucas in the chair.

New Members Elected.

James A. Grieg. J. H. Matthews. O. Nordgaard. A. T. Hopwood.

Candidates Proposed for Membership.

Alfred A. Moore, 34, Lincoln Street, Norwich (introduced by A. Mayfield and G. A. Stephen).

Edward A. Bacon, 30, Marlborough Road, Gunnersbury, London, W. 4 (introduced by R. W. Nevill and W. J. Wintle).

Member Deceased.

Dr. Simroth.

Papers Read.

"The Mollusca of Oundle, Northamptonshire," by the Rev. C. E. T. Kendall.

"Note on the Reproduction of *Obeliscus obeliscus* (Moricand)," by G. C. Spence.

Principal Exhibits.

By Mr. G. C. Spence: Specimens of *Obeliscus obeliscus*, eggs and young, to illustrate his note.

By Mr. W. H. Heathcote: A large series of local shells; also *Orthalicus zebra* and a very curious carved moonstone idol found in the interior of one of the shells. The specimens were obtained some forty years ago from a hollow log of wood from the Gulf of Maracaybo, Venezuela.

In the Special Exhibit of "British *Littorina*," series were shown by Messrs. J. W. Jackson, R. Standen, C. H. Moore, Mrs. Gill, and the Manchester Museum.

480th Meeting, held at the Manchester Museum, March 12th, 1919.

Mr. R. Standen in the chair.

New Members Elected.

Alfred A. Moore. Edward A. Bacon.

Candidates Proposed for Membership.

Miss Brenda Jennie Goble, The Mill House, Horstead, Norwich (introduced by Ralph W. Nevill and J. W. Jackson).

Herbert Henry Corbett, M.R.C.S., F.L.S., F.E.S., 3, Thorne Road, Doncaster (introduced by J. W. Taylor and J. W. Jackson).

Miss Dorothy M. Dimbleby, "Ivy Deane," Blackley, Manchester (introduced by A. J. E. Cave and J. W. Jackson).

Members Deceased.

Alan Owston. D. J. MacLeod. W. Denison Roebuck.

Paper Read.

"*Tropidophora standeni* sp.n., from Madagascar," by G. C. Spence.

Exhibits.

By Mr. G. C. Spence: Specimens of *Tropidophora* to illustrate his note.

By Mr. J. W. Jackson: Strongly decollated examples of *Bithynia tentaculata* from River Lagan, Shaw's Bridge, Belfast.

In the Special Exhibit of "British *Ena* and *Balea*," series were shown by Messrs. R. Standen, J. W. Jackson, G. C. Spence, G. H. Taylor, and the Manchester Museum.

481st Meeting, held at the Manchester Museum, April 9th, 1919.

The President (Mr. E. Collier) in the chair.

New Members Elected.

Miss Brenda Jennie Goble. Dr. H. H. Corbett. Miss Dorothy M. Dimbleby.

Candidates Proposed for Membership.

James Henry Lumb, 32, Undercliffe Terrace, Halifax (introduced by F. Booth and J. W. Jackson).

Charles Leslie Odam, B.A., M.R.C.S., L.R.C.P., 91, Breakspeares Road, Brockley, Kent (introduced by C. Oldham and J. W. Jackson).

Herbert Edwin James Biggs, 21, St. Andrew's Road, Enfield, Middlesex (introduced by J. W. Jackson and A. E. Boycott).

Member Deceased.

James N. Milne.

Papers Read.

"Obituary Notice: William Denison Roebuck," by J. W. Taylor, M.Sc.

"The *Pisidia* of Guernsey and Sark," by J. R. le Brockton Tomlin, M.A.

"Note on *Conus lineatus* (Solander) and *Conus lineatus* (Chemnitz)," by A. T. Hopwood.

Exhibits.

By Mr. B. R. Lucas: *Balea perversa* from High Billinge, Cheshire.
By Mr. C. H. Moore: Land and marine shells from Haifa.
By Mr. J. D. Dean: Embryonic *Clausilia*.
By Mr. G. C. Spence: Special Exhibit of *Obeliscus*.

It was decided to have the following Special Exhibits:—

May 14th - - *Stylifer*.
June 18th - - *Oleacina*.

482nd Meeting, held at the Manchester Museum, May 14th, 1919.

The President (Mr. E. Collier) in the chair.

New Members Elected.

James Henry Lumb. Charles Leslie Odam. Herbert Edwin James Biggs.

Candidate Proposed for Membership.

Rev. E. G. Alderson, Hartford Vicarage, near Huntingdon (introduced by E. Collier and J. W. Jackson).

Resignation.

George A. Martin.

Papers Read.

"Notes on the Growth and Variation of *Unio pictorum* (Linné)," by W. E. Alkins, B.Sc.

"On *Obeliscus (Protobeliscus) riparius* (Pfr.)," by G. C. Spence.

Principal Exhibits.

By Mr. G. C. Spence: *Obeliscus* and embryonic forms to illustrate his note.

By Mr. R. Standen: Series of *Cypræa mappa* L., showing colour variation of base, and juvenile forms; *Peristernia prismatica* Mart.; and *Trichotropis cancellata* Hinds.

By Mr. E. Collier: *Pomatia larollei* Pallary (cotype), Ras-el-Madai, Algiers; *Otala flattersiana* Ancey, Ain Sefra, Algiers; *Lantzia carinata* Jouss., Réunion; *Umbonium conicum* Ad. & Rve., Borneo; *Ampullaria scalaris* Orb., Colastun, Argentine; *Margarya melanoides* Nev., China; *Pachycheilus atra* Rich, British Guiana; *Neritina crepidularia* Lam., N.E. Queensland.

In the Special Exhibit of *Stilifer*, Mr. R. Standen showed a fine series, mainly from the "Arthur Adams' Collection," and gave an interesting account of the life-history of the genus. Mrs. Gill also exhibited.

483rd Meeting, held at the Manchester Museum, June 18th, 1919.

The President (Mr. E. Collier) in the chair.

New Member Elected.

Rev. E. G. Alderson.

Candidates Proposed for Membership.

Frederick Stanley, "Hanover," Addiscombe Road, Margate (introduced by Hugh C. Fulton and J. R. le B. Tomlin).

Francis J. Ede, A.M.I.C.E., M.I.C.E., F.G.S., Silchar, Cachar, India (introduced by Edward Collier and G. C. Spence).

Member Deceased.

S. L. Petty.

Paper Read.

"A Scheme for the Division of the British Marine Area into Census Areas," by R. Winckworth.

Principal Exhibits.

By Mr. R. Harrison: *Helix nemoralis* vars. *libellula*, *olivacea*, etc. (all unbanded), *H. hortensis* and *H. arbustorum* from Dove Dale; *H. nemoralis* var. [illegible] (banded), from Nabs Dale, Dove Dale, Derbyshire.

By Mr. A. T. Hopwood: Rare forms of *Conus*; also fossil species; *Anodonta cygnea* and young *Vivipara contecta* from Sallies' Pond, Chorlton-cum-Hardy, Manchester.

By Mr. J. G. Kitchen: *Planorbis contortus* from Poundswick, Cheshire.

By Mr. G. C. Spence: *Stenogyra sowerbyana* and embryonic shells from the shore of Lake Tanganyika; *Brachypodella leucopleura* from Chichirivichi, Venezuela (coll. F. G. Percival).

By Mr. R. Standen: An unusually large specimen of *Ærope caffra*, diam. 82 mm., alt. 46 mm.

In the Special Exhibit of *Oleacina*, series were shown by Messrs. E. Collier, R. Standen, and J. G. Kitchen, and by the Manchester Museum.

It was decided to have the following Special Exhibits:—

September 10th	- - -	*Streptaxis.*
November 12th	- - -	*Physa.*
December 10th	- - -	British *Cardium.*

◆

Vertigo alpestris in Borrowdale, Cumberland.—The researches of Messrs. Dean and Kendall (*Journ. of Conch.*, xii., pp. 209—11 and 309) have shown how widely spread *Vertigo alpestris* is in the English lake district, and the sole purpose of this note is to record its occurrence in extraordinary numbers. At Rosthwaite, last June, I spent a few minutes on four successive mornings in searching the top of a slate wall covered with ivy in which were entangled dead leaves of oak and apple from overhanging trees. In a length of less than six feet I collected 402 living specimens of *V. alpestris* and 35 of *V. pusilla*, and on the occasion of my last visit no material diminution in the number of the molluscs was apparent. The association of *V. pusilla* and *V. alpestris* has already been commented upon by Messrs. Dean and Kendall, but apparently the relative numbers are by no means constant, for whereas of my Rosthwaite gathering 92 per cent. were *alpestris* and 8 per cent. *pusilla*, a gathering of 74 shells in a similar habitat at Little Crosthwaite, on the shore of Bassenthwaite Lake, comprised 44·6 per cent. of *alpestris* and 55·4 per cent. of *pusilla*.—CHAS. OLDHAM (*Read before the Society*, October 12th, 1918).

EDITORIAL NOTES.

THE Annual Meeting will be held at the Manchester Museum on the third Saturday in October. Members will receive the usual notice and ballot papers in a month or two's time, and it is to be hoped that the 1919 Meeting will be a record one in numbers and in enthusiasm as befits this *annus mirabilis.* The President will give an address on his experiences as a collector.

Mr. C. P. Hurst has an interesting paper in the Wiltshire Archæological and Natural History Magazine, vol. 40, p. 231, on East Wilts. Mollusca, mostly collected in the Great Bedwyn district. He makes the particularly interesting observation that the land shells, lepidoptera, and flowering plants of this district all exhibit "a well-marked tendency to albinism, possibly an attempt to adapt themselves to their white environments in this chalky country." Amongst the species found and commented on are *Ena montana*, *Clausilia rolphii*, *Limnæa glabra*, *Limax cinereoniger*, and *Azeca tridens.*

Dr. J. C. Melvill sends the following:—"It may interest some to know that the transference of my collection of shells, now numbering, roundly speaking, some 23,000 species, into the hands of Mr. J. R. le Brockton Tomlin, has been mutually arranged between us, and will shortly be a "fait accompli." It is proposed that it be known in future as the Melvill-Tomlin Collection, and the latter's extensive series of mollusca be added to it, when it is moved from Shrewsbury to Reading.

The chief reasons for my decision to part with what has been the subject of an ever-increasing labour of love with me during the past sixty years, and even more —for I began the collection when only eight years old—are, firstly, "Anno Domini." One feels growing gradually older, and I surmised that if activities ceased, reaction must follow, to the detriment of the collection, now completely arranged. Secondly, as to its ultimate fate, I much wished, if possible, to avoid any ultimate break-up, or scattering abroad of its component parts, now so harmoniously grouped together; and, accordingly, when Mr. Tomlin unexpectedly, and without any previous suggestion on my part, made certain proposals to me, I agreed, for not only would I rather see it in the hands of so fast a friend and ally, than deposited elsewhere, but especially as he voluntarily assured me of his ultimate intention to leave it to some important institution—I hope in this country— where it would be well-housed, kept in order, and rendered useful to the community for educational purposes in every possible way for all time. Before long, it is hoped to give a brief résumé of some of its more important contents, either in the pages of this *Journal* or elsewhere.

It will be noticed elsewhere in this number that the de Burgh Collection is offered for sale. This collection was formed in the middle of last century, and was famous alike for the rarity and the fineness of its specimens. Probably the greatest gems are *Pleurotomaria quoyana*, *Conus gloria-maris* and *Thatcheria mirabilis*, though the last-named has frequently been considered to be a monstrosity of *Fusus.* In *Conus* it can also boast of *cervus*, *omaicus* and *stainforthii*; in *Cypræa* of *bicallosa* and *nivosa*; in Pelecypods of *Cardium belcheri* and *Pholadomya candida.*
The total number of species is about 9,00.

Following upon Prof. Boycott's discovery of parthenogenesis in *Paludestrina jenkinsi*, Mr. G. C. Robson, of the Natural History Museum, has issued the following :—

23/7/19.

" Dear Mr. ——

Mr. J. B. Gatenby, of University College, and I are studying the question of Parthenogenicity in *Paludestrina jenkinsi* recently made known by Dr. Boycott, F.R.S.

We are most anxious to obtain the following for our work :—

1. *Paludestrina jenkinsi* from brackish or estuarine water.
2. ,, *taylori* from any locality.
3. ,, *ventrosa* from any locality.
4. ,, *stagnalis* from brackish and salt water.
   sc. = *Hydrobia ulvæ.*

I wonder if you have any preserved (spirit) material of these forms from the above localities, or if you are likely to be going to any place where you might be able to obtain some for us. I would be most grateful for any you could send me; and would refund any postage for parcels sent. The latter should be marked with a capital *P* to ensure prompt attention. The animals should be collected *alive*, and packed in a box with *moist* weeds and a little mud. If possible they might be sent in a small glass bottle, in the same water as that in which they are found. The bottle can be sent in a wooden box. Precise localities should be given on a label. If you are unable to do anything for us, would you kindly ask any friend of yours who might be able to do so ?

Believe me, yours sincerely,

G. C. Robson."

NOTE ON THE REPRODUCTION OF OBELISCUS OBELISCUS (Moricand)).

By GEO. C. SPENCE.

(Read before the Society, February 12th, 1919).

On cleaning out the shells of two specimens of this fine Brazilian snail I found in one eight embryonic young (largest 8 × 3·5 mm.) and in the other the same number of eggs. These latter measure 5·5 × 4 mm., are a regular oval shape, and have a remarkably thick calcareous shell of old-ivory colour (probably originally whitish but stained by the decayed animal matter) with a smooth half-polished surface.

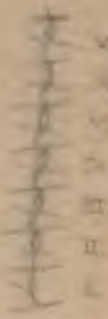
Obeliscus is described in Tryon's Manual, vol. xviii., page 240, as being viviparous, but this species at any rate appears to be ovo-viviparous. The embryos grow considerably (vide above measurements) between the absorption of the calcareous egg-shell and their birth, at which, according to Moricand, they are enclosed in "a capsule of clear limpid fluid confined by an extremely thin membrane" —See Tryon's Manual, vol. xviii., plate 34, fig. 48.

Rare Shells in Shell-Pockets on the Wirral Sand-Dunes.—Whilst staying at Hoylake, Cheshire, in August last, I came across some excellent "shell-pockets" on the sand-dunes. The best examples occurred near Meols, and these yielded the most interesting species of mollusca. The following is a list of shells obtained:—*Helix aspersa* (few; very young), *H. nemoralis* (few; very young), *H. barbara* (few tips), *H. caperata* (common, large), *H. hispida* (common), *Vitrina pellucida* (3), *Vallonia excentrica* (common), *V. costata* (common), *Cochlicopa lubrica* (common, large and small), *Clausilia bidentata* (1), *Pupilla muscorum* (common; variable in size; many without denticle), *Carychium minimum* (2), *Vertigo pygmaea* (20), *V. antivertigo* (17), *V. pusilla* (1), *V. angustior* (1), *V. minutissima* (1), *Succinea elegans* (common), *Limnaea pereger* (few; small), *L. truncatula* (many of a very small form), *L. palustris* (few; young), *Planorbis leucostoma* (3), *Pl. laevis* (=*glaber*) (1), and *Peringia* (=*Hydrobia*) *ulvae* (few). In "pockets" on dunes between Hilbre Point and West Kirby the most noteworthy species found were *Lauria cylindracea* (rare), *Vertigo antivertigo* (2), and *Peringia* (=*Hydrobia*) *ulvae* (abundant). The latter are of the typical form, such as is found on the adjacent Dee marshes—close to the type locality: "shores of Flintshire." On the Hoylake shore a much larger form occurs in addition. In "pockets" on dunes in a third locality, near Leasowe Castle, the following were found, in addition to many of the more common species: *Limnaea truncatula* (few of very small form), and *Phytia myosotis* (=*denticulata*) (1 specimen). Several of e forms mentioned above are new to the Cheshire list, but it is doubtful whether se can now be found in a living state in the neighbourhood owing to the changes which have gone on. This applies more especially to the Vertigos and other moisture-loving species. The majority of the "shell-pocket" forms are very old and sand-worn shells, and have in all probability been blown up from the eroded patches of former land-surfaces at the base of the sand-dunes. These land-surfaces are known to have yielded numerous land and freshwater species in the past, but are [illegible] almost inaccessible for detailed study.—J. WILFRID JACKSON (*Read* [illegible] *Society*, September 11th, 1918).

Hygro[illegible] revelata Férussac **in North Devon.**—In August, 1917, I found
[illegible] high land at the back of Saunton, near Braunton. A few days
[illegible] arge numbers on Baggy Point, near Croyde. This is of interest
[illegible] tween Hartland Point, where it was discovered by Mr. J. R. le
[illegible] and Ilfracombe, for which it has been recorded by Mr. C. P.
[illegible] two stations, The Lizard, Land's End District, Falmouth,
[illegible] ded me specimens in past years, so that I have had much
[illegible] r this snail. It seems to like a south or west aspect, very
[illegible] found it chiefly at the roots of Heather and under stones
[illegible] and *Rumex acetosella* were growing. I think the latter
[illegible] s favourite food.—ALAN GARDINER (*Read before the*
[illegible] 18).

2

3



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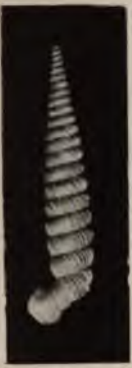
6

Photo. J. W. Jackson

[illegible] [illegible] [illegible] [illegible], × 2½.
[illegible] [illegible], sp. nov., × 2½.
[illegible], × ½.
[illegible] [illegible] [illegible], sp. nov., natural size.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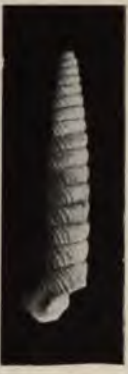
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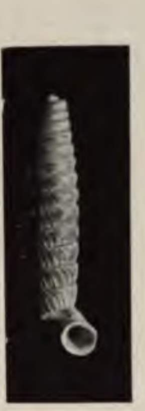
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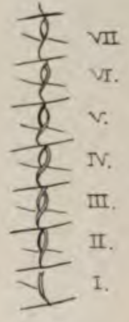

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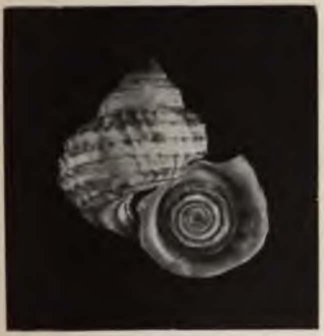
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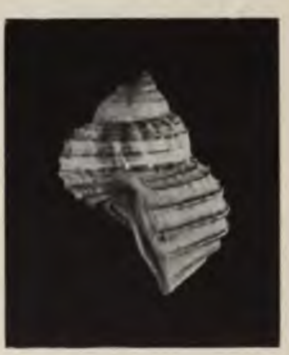
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(Photo., J. W. Jackson.

FIG. 1.—*Brachypodella trinitaria* (Pfr.), × 2¼.
,, 2-3.— ,, *oropouchensis*, sp. nov., × 2¼.
,, 4.— ,, ,, (axis), × 5.
,, 5-6.—*Tropidophora standeni*, sp. nov., natural size.

THE

JOURNAL OF CONCHOLOGY.

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LIST OF MEMBERS.

Corrected to Jan. 4, 1920.

(With year of election; O — founder, or original member; L = Life Member; P = has filled the office of President; *post packets have been returned undelivered).

HONORARY MEMBERS.

(Limited to ten in number).

1889. Cossmann, Maurice, 95, Rue de Maubeuge, Paris.
1897. Dall, Wm. Healey, A.M., D.Sc., Smithsonian Institution, Washington, D.C., U.S.A.
1913. Dautzenberg, Ph., 209, Rue de l'Université, Paris.
1897. *P* Godwin-Austen, Lt.-Col. H. H., F.R.S., etc., Nore, Hascombe, Godalming.
1905. Pelseneer, Prof. Paul, 53, Rue Longue Haie, Brussels, Belgium.
1906. Pilsbry, H. A., Academy of Natural Sciences, Philadelphia, Pa., U.S.A.
1889. Sars, Prof. G. O., Universitet, Christiania, Norway.
O *P* Taylor, John W., M.Sc., North Grange, Horsforth, Leeds.

ORDINARY MEMBERS.

1903. Abbott, G., 20, Morley Street, Kettering.
1906. Adams, F. E., Shiel, Sandy Lane Road, Cheltenham.
1917. Adams, John Herbert, Lemain, Looe, Cornwall.
1885. *P* Adams, Lionel Ernest, B.A., Oak Hill, Chart Road, Reigate, Surrey.
1919. Alderson, Rev. E. G., Hartford Vicarage, near Huntingdon.
1918. Alkins, W. E., M.Sc., Stoneydale, Oakamoor, Stoke-on-Trent.
1911. Allan, Harry, jr., Edina, Parsonage Road, Heaton Moor, Manchester.
1914. Arkell, Lieut. A. J., Royal Air Force, Hinxhill Rectory, Ashford, Kent.
1895. Arnold, Bernard, F.L.S., Milton Lodge, Gravesend.

1908. Bacchus, A. D. R., National Provincial and Union Bank of England, 31, Corn Street, Bristol.
1919. Bacon, Edward A., 30, Marlborough Road, Gunnersbury, London, W. 4.
1911. *L* Barnard, K. H., B.A., South African Museum, Capetown.
1913. *L* Bartlett, H. F. D., F.E.S., 1, Myrtle Road, Bournemouth.
1918. Bartlett, T. O., Lloyds Bank, Ltd., Westbourne, Bournemouth.
1907. *L* Bartsch, Dr. Paul, Smithsonian Institution, Washington, D.C., U.S.A.
1907. Bavay, A., 82, Rue Lauriston, xvi^{e}, Paris.
1901. Beeston, Harry, Sunnymead, South Street, Havant, Hants.
1919. Belcher, Taswell Edward, "Trefloyne," Sandringham Road, Parkstone, Dorset.
1904. Benn, C. A., M.A., F.G.S., Moor Court, near Kington, Herefordshire.
1901. Bentley, R. H., 60, Rosebery Road, Muswell Hill, N. 10.
1919. Biggs, Herbert Edwin James, 21, St. Andrew's Road, Enfield, Middlesex.
1897. Blackburn, Rev. E. Percy, 24, Hockliffe St., Leighton Buzzard, Northants.
1897. Blake, Wm. Charles, 2, Acacia Villas, Ross, Herefordshire.
1895. Bles, Edward J., M.A., D.Sc., Elterholm, Madingley Road, Cambridge.
1897. Bliss, Joseph, Boar Bank Hall, Grange-over-Sands.
1907. Bloomer, H. H., 40, Bennett's Hill, Birmingham.
1899. Blundell, Mrs. Jessie M., Argyll House, Cirencester.
1910. Booker, H. H., 153, Albert Road, Heeley, Sheffield.
1904. Booth, Fred, 18, Queen's Road, Shipley, Yorks.
1884. Bostock, Edwin D., F.E.S., Oulton Cross, Stone, Staffordshire.
1906. Boult, J. W., 50, Washington Street, Newland, Hull.

1897. *P L* Boycott, Professor A. E., M.A., D.M., F.R.S., 17, Loom Lane, Radlett.
1899. Brookshank, Hugh, M.B., College Road, Windermere.
1905. *L* Bromehead, C. N., Geological Survey and Museum, Jermyn Street, London, S.W. 1.
1911. Brown, Edmund R., 237, Brunswick Street, Manchester.
1913. Bryan, B., 176, Uttoxeter Road, Longton, Staffs.
1897. Burnup, Henry Clifden, Box 182 P.O., Maritzburg, Natal.
1879. Butterell, J. Darker, Manor House, Wansford, Hull.
1902. Button, Fred. L., Bacon Building, Oakland, California, U.S.A.

1006. *L* Carpenter, Geoffrey D. H., B.A., M.B., c/o P.M.O., Entebbe, Uganda.
1913. Carr. Professor J. W., M.A., F.L.S., F.G.S., F.E.S., University College, Nottingham.
1918. Carro, Miss Lucia D., Monmouth House, Topsham, R.S.O., Devon.
1919. Cartwright, W., 4, Leek Road, Buxton.
1903. Cattell, W. Chas., The Poplars, Montagu Street, Kettering.
1918. Cave, Alexander J. E, "Avoca," Hill Lane, Blackley, Manchester.
1915. Challis, Miss B. M., 1210, Brockman Building, Los Angeles, Cal., U.S.A.
1889. Christy, Miller, F.L.S., Broom Wood Lodge, Chignal St. James, Chelmsford, Essex.
1904. Clapp, Geo. H., Corner 7th & Bedford Aves., Pittsburgh, Pa., U.S.A.
1913. Clapp, W. F., 25, Ware Street, Cambridge, Mass., U.S.A.
1886. Coates, Henry, F.R.S.E., Corarder, Perth.
1880. *P* Collier, Edwd., Glen Esk, Whalley Range, Manchester.
1898. *P L* Collinge, Walter E., D.Sc., M.Sc. (Birm.), F.L.S., F.E.S., The University, St. Andrews, Scotland.
1913. Connolly, Major M., The Lock House, Frimley Green, Surrey.
1918. Cook, Maurice, B.Sc., 13, Victoria Place, Hartlepool.
1901. *P* Cooke, Rev. Alfred H., M.A., D.Sc., F.Z.S., Aldenham School, Elstree, Herts.
1892. Cooper, James Eddowes, Grangemount, 9, Duke's Avenue, Church End, Finchley, N. 3.
1919. Corbett, Herbert Henry, M.R.C.S., F.L.S., F.E.S., 3, Thorne Road, Doncaster.
1910. Cribb, Lieut. C. Theodore, 4, Sheffield Terr., Campden Hill, London, W.8.
1899. Crowther, J. E., Portland Street, Elland, Yorks.

1897. Dacie, John Charles, 30, Montserrat Road, Putney, S.W. 15.
1913. Dalton, E. N., 62, The Avenue, Highams Park, Chingford.
1913. Davey, W. J., 19, Allfarthing Lane, Wandsworth Common, S.W. 18.
1916. Davies, W. H., 22, Pine Grove, Monton, Eccles, Lancs.
1909. Dawes, L., Hambledon, Old Headington, Oxford.
1915. Day, Henry, M.Sc., Clifton Terrace, Hayfield Road, Chapel-en-le-Frith.
1915. Deakin, Percy T., c/o J. W. Moore, 151, Middleton Hall Road, King's Norton, Birmingham.
1898. Dean, J. Davy, 20, S. Fagan's Road, Ely, Cardiff.
1916. Despott, Giuseppe, Valletta University, Malta.
1909. Dickson, Robert Cecil, M.B., Ch.B., 29, Strathmartine Road, Dundee.
1919. Dimbleby, Miss Dorothy M., "Ivy Deane," Blackley, Manchester.
1909. *L* Diver, Capt. Cyril, M.A., 40, Pembroke Square, Kensington, London, W.8.
1916. Doello-Jurado, Professor M., Museo Nacional de Historia Natural, Peru, 208, Buenos Aires.
1910. Dyke, F. M., B.Sc. (Lond.), Nelson Croft, 29, Church Road, Lower Bebington, Cheshire.

1919. Ede, Francis J., A.M.I.C.E., M.I.C.E., F.G.S., Silchar, Cachar, India.
1895. Edwards. Thos., 247, Narborough Road, Leicester.
1901. Edwards, W. H., Hastings Museum. Victoria Institute, Worcester.
1891. Elgar. Hubert. Museum and Public Library, Maidstone.
1904. *L* Eliot, Sir Chas., K.C.M.G., Vice-Chancellor, University, Hongkong.
1884. Elliot, Edward J., 56, High Street, Stroud, Gloucestershire.
1910. Elliott, W. T., D.D.S., F.L.S., F.Z.S., Arden Grange, Tanworth-in-Arden,
Warwickshire.
1913. Emmett, H., 156, Moston Street, Hanley, Staffs.
1894. Evans, Wm., F.R.S.E., 38, Morningside Park, Edinburgh.

1918. Falcon, W., M.A. (Cantab.), Hilton College, Hilton Road, Natal.
1897. *L* Farquhar, John, 3. Rose Terrace, African Str., Grahamstown, Cape Colony
1891. Farrer, Captain Wm. James, 1, Courtfley Road, Southport.
1897. Fielding, Clement, M.P.S., Clover Hill, Halifax, Yorks.
1915. Firth, J. Digby, F.L.S., F.E.S., Boys' Modern School, Leeds.
1884. *L* Fitzgerald, Rev. H. Purefoy, F.L.S., Lidwells, Goudhurst, Kent.
1912. *L* Frames, P. R., P.O. Box 148, Johannesburg, S. Africa.
1905. Freeman, William, Hawkhurst, Milton Road, Oundle.
1892. Fulton, Hugh, 27, Shaftesbury Road. Hammersmith, London, W. 6.
1913. Fysher, Greevz, 78, Chapel Allerton Terrace, Leeds.

1907. *L* Gabriel, Charles J., 297, Victoria Street, Abbotsford, Victoria, Australi[illegible]
1914. Gardiner, Alan, B.Sc., The Bridge House, Bradfield College, Reading.
1913. Gauntlett, H. L., M.R.C.S., L.R.C.P., A.K.C., 45, Hotham Ro[illegible]d
Putney, S.W. 15.
1908. Gill, Mrs. A. E., Dinant Cottage, 1, Claude Road, Chorlton-cum-Hard[illegible]
1916. *L* Gladstone, John S., Nanhurst, Cranleigh, Surrey.
1919. *L* Goble, Miss Brenda Jennie, The Mill House. Horstead, Norwich.
1886. *L* Godlee, Theo.. Whips Cross, Walthamstow, Essex.
1904. Gray, Arthur F., Exchange Building. 53, State St., Boston, Mass., U.S.
1919. *L* Grieg, James A.. Curator. Bergens Museum, Bergen, Norway.
1890. Gude, G. K., F.Z.S., 9, Wimbledon Park Road, S.W. 18.
1907. Gyngell, Walter, 15, Gordon Street, Scarborough.

1909. Haas, Dr. Fritz, Senckenberg Museum, Victoria-Allee 7, Frankfurt a. Mai[illegible]
1910. Hadden, Norman G., Breezy Bank, West Porlock, Somerset.
1895. Hann, Rev. Adam. 20, Canute Road, Stretford, Manchester.
1895. Hardy, John Ray, 25, Griffin Grove, Levenshulme, Manchester.
1887. Hargreaves, J. A., 46, Park Square, Leeds.
1913. Harman, A., 5, Harley Street, Scalby Road, Scarborough.
1909. Harrison, Richard, 79, Upper Duke Street, Hulme, Manchester.
1889. Hartley, Alfred, 19, Thorpe Garth, Idle. near Bradford, Yorks.
1907. Hawkins, H. L., University College, Reading.
1887. Heathcote, Wm. Henry, F.L.S., The Marsh, Longton, Preston, Lancs.
1907. Henderson, J. B., jr., 16th Street and Florida Avenue, Washington. D.[illegible]
U.S.A.
1913. Heller, Julius, Villa Gisela, Teplitz, Bohemia.
1895. Hibbert, Charles R. C., South Close, Landcross, Bideford, Devon.
1895. *P* Hickson, Prof. Sydney J., D.Sc., M.A., F.R.S., University, Manchester
1918. Hill, John, 8, Stanley Street, Leek, Staffs.

Hillman, Thomas Stanton, Eastgate Street, Lewes, Sussex.
Hindley, R. T., Hawthorn Cottage, Buxton Old Road, Macclesfield.
Hirase, Y., Karasumaru, Kyoto, Japan.
Hitchon, Mrs. Susan A., Rhyddington, Oswaldtwistle, Lancs.
Hopwood, Arthur Tindell, 9, Stamford Road, Chorlton-cum-Hardy, Manchester.
Horsley. Rev. Canon J. W., M.A., Detling Vicarage, Maidstone.
Horton-Smith, Dr. W., M.B., Ravenswood, Winnington, Northwich.
Horwood, A. R., Leicester Museum and Art Galleries, Leicester.
Howard, Vernon, Homelands, Barnes Close, Winchester.
Howell, George O., 210, Eglinton Road, Plumstead, Kent.
Howorth, Sir Henry Hoyle, K.C.I.E., M.P., F.R.S., etc., 45, Lexham Gardens, London, W. 8.
Hoyle, W. E., M.A., D.Sc., The National Museum of Wales, Cardiff.
Huggins, Henry C., Oldestede Cottage, Chesnut Street, nr. Sittingbourne.
Hurst, C. P., Ivy House, Great Bedwyn, Hungerford.
Hutton, W. Harrison, 44, Dial Street, Leeds.

Ingrams, Lieut. W. H., 7th The King's Shropshire Light Infantry, c/o G.P.O., London.

Jackson, J. Wilfrid, F.G.S., The Museum, The University, Manchester.
Jenkinson, Charles, Cliffe House, London Road, Kettering.
Jenner, James Herbert Augustus, F.E.S., Eastgate House, Lewes.
Jewell, Miss F., Emsworth, Hants.
Johnson. Chas. W., Boston Society of Natural History, Boston, Mass., U.S.A.
Jones, Eric Wolfe, 5, Chandos Road, Heaton Chapel, Stockport.
Jones, Surgeon-Commander K. H., M.B., Ch.B., F.Z.S., R.N., The Manor House, St. Stephen's, Canterbury.

Kendall, Rev. C. E. Y., B.A., Oundle, Northants.
Kennard, A. S., Benenden, 161, Mackenzie Road, Beckenham, Kent.
Kennedy, Lieut. J. Noble, M.C., The Manse, Port Patrick, Wigtownshire
Kensett, Percy F., Broadmeadow, Coombe Lane, Wimbledon, S.W. 19.
Keogh, Duncan, 13, Richmond Wood Road, Bournemouth.
Kitchen, J. G., 19, Byrom Street, Altrincham, Cheshire.
Knight, Rev. G. A. Frank, M.A., F.R.S.E., 5, Granby Terrace, Hillhead, Glasgow.

Laidlaw, Dr. F. F., M.A., Hyefield, Uffculme, Cullompton, Devon.
Lancaster, Ernest Le Cronier, B.A., M.B., Winchester House, Swansea.
Langmead, L. B., Uplands, Honor Oak Road, Forest Hill, S.E. 23.
Laverack, Clyve C., Ph.C., M.P.S., Broughton Rise, Malton.
Lawson, Arthur K., 11, Addison Road, Hale, Cheshire.
Lawson, Peter, Jesmond, 13, Nella Road, Fulham Palace Road, Hammersmith, W. 6.
Leman, George C., Wynyard, 152, West Hill, Putney, S.W. 15.
Levett, Rev. T. T., F.Z.S., Frenchgate, Richmond, Yorks.
Lightfoot, Robert M., South African Museum, Cape Town.
Longstaff, Mrs. G. B., F.L.S., Highlands, Putney Heath, S.W. 15.
Lucas, B. R., F.G.S., Winnington Park, Northwich, Cheshire.
Lumb, James Henry, 32, Undercliffe Terrace, Halifax.

1917. *L* Marle, Rev. Robert, M.A., Cross Stone Vicarage, Todmorden, Yorks.
1887. *P* Masefield, John R. B., M.A., Rosehill. Cheadle, Staffordshire.
1904. Massy, Miss A. L., Department of Agriculture (Fisheries Branch), 3, K
dare Place, Dublin.
1919. Matthews, John Hugoe, 6, York Road, Chorlton-cum-Hardy, Manchest
1889. Mayfield, Arthur, Mendlesham, Stowmarket, Suffolk.
1914. Mazyck, W. G., Hon. Curator, Charleston Museum, S. Carolina, U.S.
1903. McClelland, Hugh, The Manor House, Berkswell, near Coventry.
1880. *P* Melvill, James Cosmo, M.A., D.Sc., F.L.S., Meole Brace Hall, Shrewsb
1906. Monterosato, Il Marchese di, 2, Via Gregorio Ugdalena, Palermo, Sicil
1919. Moore, Alfred A., 34, Lincoln Street, Norwich.
1902. *L* Moore, Chas. H., 103, Mottram Road, Stalybridge.
1907. Morey, Frank, F.L.S., Wolverton, Carisbrooke Rd., Newport, Isle of Wig h
1917. Morley, John, A.M.I.Inst.E., 2, Clarence Villas, Ashburton Road, Traff
Park, Manchester.
1918. Mückardt, Harald, Drottninggatan, 11, Helsingborg, Sweden.
1912. Murdoch, G. H., 49, Parliament Hill, Hampstead, N.W. 3.
1907. Musham, J. F., F.E.S., Haylands, Brook Street, Selby, Yorks.

1905. Napier, H. C., Elms Lodge, 39, Kingston Lane, Teddington.
1911. Nash, Rev. E. H., M.A., Wetley Rocks Vicarage, Stoke-on-Trent.
1918. Nelson, Geo., 38, Griffiths Street, Falkirk, Stirlingshire.
1918. *L* Nevill, Rev. Ralph William, M.A., Beighton Rectory, Norwich.
1891. *P* Newton, Richard Bullen, F.G.S., 11, Twyford Crescent, Acton Hill, W 3
1919. Nordgaard, O., Director of the Biological Station, Trondhjem, Norway.
1915. *Norwood, Mrs. Gilbert, 4, The Glen, Saundersfoot, Pembrokeshire.

1919. Odam, Charles Leslie, B.A., M.R.C.S., L.R.C.P., 91, Breakspeares R d,
Brockley, Kent.
1887. *L* Oldham, Chas., F.L.S., F.Z.S., The Bollin, Shrublands Rd., Berkhamsted.
1910. Oliver, A. M., Thorney Close, Fenham, Newcastle-on-Tyne.
1896. *L* Overton, Harry, The Newlands, Boswell Road, Sutton Coldfield.

1904. Parritt, H. W., 14, Stanhope Gardens, Highgate, N.
1886. Pearce, Rev. S. Spencer, M.A., Long Combe Vicarage, near Woodstock,
Oxfordshire.
1913. *L* Pellow, N. E., 319, Stratford Road, Sparkbrook, Birmingham.
1918. Perry, Edmund E., 6, Stuart Crescent, Wood Green, London, N. 22.
1908. Phillips, R. A., Ashburton, Cork.
1897. Preston, Hugh B., F.Z.S., 18, Rue des Tribunaux, Vannes, Morbihan,
France.
1907. Priske, R. A. R., 9, Melbourne Avenue, West Ealing, Middlesex.
1906. *L* Pritchard, G. B., F.G.S., 38, Mantell Street, Moonee Ponds, Victoria.
1916. Pye, Alfred W., Mortagne, Dudley Street, Grimsby.

1916. Quick, Capt. Hamilton E., M.B., F.R.C.S., 137, Walter Road, Swansea.

1906. *L* Radley, Percy E., F.R.M.S., Nesta, Station Road, Broxbourne, Herts.
1906. Reynell, Alexander, Shandon Cottage, Harestone Hill, Caterham Valley.
1913. Rhodes, F., 113, Heaton Road, Manningham, Bradford, Yorks.
1900. Richards, C. P., Mission House, Stenalees, St. Austell, Cornwall.

1898. Roberts, A. William Rymer, Rothamsted Experimental Station, Harpenden, Herts.
1918. Robins, E. A., Swinton Lodge, Essex Road, Watford.
1901. Rooth, J. A., M.R.C.S., 1, Goldsmid Road, Brighton.
1893. Roseburgh, John, Market Square, Galashiels, Roxburgh.
1910. *L* Rowe, A. W., M.S., M.B., M.A.C.S., F.G.S., Shottendane, Margate.

1914. Saban, Alfred J., 73, Rye Hill Park, Peckham Rye, S.E. 15.
1906. *L* Salisbury, Albert E., 12a, The Park, Ealing, W. 5.
1877. *P* Scharff, Robert F., Ph.D., M.R.I.A., Knockranny, Bray, co. Wicklow.
1895. *L* Schill, C. H., Crosten Towers, Alderley Edge.
1918. Schlesch, Hans, Seydisfjardar Apotek, Seydisfjördar, East Iceland (via Leith).
1910. *L* Shaw, H. O. N., B.Sc., F.Z.S., 112 & 114, Wardour Street, London, W. 1.
1904. Shaw, Rev. W. A., Peper Harow Rectory, Godalming.
1906. Shopland, Commander E. R., 255, London Road, S., Lowestoft.
1910. Shrubsole, George, Elm Bank, Workington, Cumberland.
1895. *L* Sich, Alfred, F.E.S., Corney House, Chiswick, W. 4.
1905. Simpson, James, c/o G. Sim, Esq., A.L.S., 52, Castle Street, Aberdeen.
1902. Smallman, Raleigh S., Eliot Lodge, Albemarle Road, Beckenham.
1899. *L* Smith, Mrs. Lucy A., Cricklade Street, Cirencester.
1907. Smith, Maxwell, Hartsdale, Westchester Co., New York, U.S.A.
1894. Smith, Wm. Chas., 92, Dawes Road, Fulham, S.W. 6.
1900. Solly, E. H., Lea Orchard, Ottinge, Elham, near Canterbury.
1917. Sowden Harry, Hon. Recorder, York and District Field Naturalists, Micklegate Bar, York.
1886. Sowerby, Geo. Brettingham, F.L.S., 26, Ennerdale Rd., Richmond, Surrey.
1907. Spence, G. C., 10, Pine Grove, Monton, Eccles, Lancs.
1914. Stainton, Ernest, 70, Jubilee Road, Doncaster.
1906. Stalley, Henry J., Thorntona, Oxted, Surrey.
1886. *P* Standen, Robert, The Museum, The University, Manchester.
1919. Stanley, Frederick, "Hanover," Addiscombe Road, Margate.
1915. Steenberg, C. M., Mag. Sc., Petersborgvej, 6[1] Copenhagen.
1903. *L* Stelfox, A. W., M.R.I.A., Ballymagee, Bangor, co. Down.
1918. Stephens, G. A., F.L.A., City Librarian, The Public Library, Norwich.
1910. Stephenson, H. L., 90, Tempest Road, Beeston Hill, Leeds.
1908. *L* Stobart, H. J. S., Belbroughton, Stourbridge.
1897. Stracey, Bernard, M.B., Pension-Schönbuhl, Oey-Dieintigen, Summenthal, Canton Bern, Switzerland.
1890. Stubbs, Arthur Goodwin, The Meads Cottage, Hailey Lane, Hertford.
1893. Stump, Edward C., Balgownie, Rochdale Road, Blackley, Manchester.
1895. Swanton, E. W., The Educational Museum, Haslemere, Surrey.
1888. *P* Sykes, Ernest Ruthven, B.A., F.L.S., Longthorns, Blandford.

1910. Tattersall, W. M., D.Sc., The Museum, The University, Manchester.
1895. Taylor, Fred, 42, Landseer Street, Park Road, Oldham, Lancs.
1907. Taylor, G. H., School House, Higher Blackley, Manchester.
1904. *L** Taylor, Gerald Medland, Rossall School, Fleetwood.
1907. Taylor, J. Kidson, 45, South Avenue, Buxton.
1903. Thaanum, D., Box 746, Hilo, Hawaiian Islands.
1907. *L* Thornton, H. G., Kingsthorpe Hall, Northampton.

record of this variety, by Mr. J. W. Taylor from Swillington, near Leeds. I have always found *Aplexa hypnorum* a very erratic species; you may find it in plenty one season, and in the next not a single specimen. *Planorbis contortus* is another species sometimes found very pale, if not quite white, also covered with confervoid growth. I found this variety in the Peak Forest Canal, at Marple, in 1876.

I find in my notes for April, 1876, that I went to a field near Platt Church, Rusholme, where there were four ponds. In pond no. 1 I could only find *Sphærium corneum*. In no. 2 *Planorbis vortex*, *P. complanatus*, and some rather small *Limnæa pereger*, with the spire much decollated. In no. 3 *P. vortex* and *P. complanatus*, very fine, and some very good specimens of *Physa fontinalis*; also *L. pereger*, but very much larger and finer than in pond no. 2, and not decollate. In pond no. 4 were *P. vortex* and *L. stagnalis*, very abundant. Being only a beginner, I did not notice whether there was any connection from one pond to another, and I could not account for *L. pereger* being decollate in one pond and not in the other.

Soon after I commenced collecting, I went with one of my brothers to Belgium, and on the outskirts of Antwerp, after heavy rain, I found very large specimens of *Succinea putris*, and was at that time very much surprised to find that the animal covered the shell almost completely. This is why the shells of *Succinea*, *Vitrea*, and *Helicarion* are always so clean and bright. Whilst collecting in a ditch between the lines of earthworks that had been made for the defence of Bruges I had an experience which might have been very unpleasant. A gendarme, who was on duty on the top of the embankment, seeing me with my dredge in the water, went up to my brother who was watching me, and spoke to him in a patois he could not understand. Scenting trouble, he just pointed to me, and then to his own head, which seemed so to satisfy the gendarme that he walked away, evidently believing that I had a "slate off."

As regards *Helix nemoralis* and *H. hortensis* I have at times found these two species living together on the same bank or hedgerow, but not very often. The case I remember best was at Mappleton, in Dovedale, when in 1892 I found large quantities of both species on the way to Thorpe Cloud. At Croyde Bay, in North Devon, I found *H. hortensis* very plentiful on one side of the lane, facing south, going from the village to the sea, but no *H. nemoralis*; but on the other side *H. nemoralis* sparingly, but no *H. hortensis*. From this one would conclude that *H. nemoralis* prefers more shade than *H. hortensis*, although in some places I have found *H. nemoralis* in quantity with little or no shade, especially on the sand-dunes in Ireland

REMINISCENCES AND PRACTICAL HINTS ON COLLECTING.

By E. COLLIER.

(Presidential Address delivered at the Annual Meeting, October 18, 1919).

Boys and youths generally do some kind of collecting, and as a youth I collected birds' eggs, butterflies and moths, shells, stamps, etc., but soon after coming to Manchester in 1869 I was introduced to the late Mr. Thos. Rogers, and by him invited to the meetings of the Lower Mosley Street Natural History Society. As Mr. Rogers was not only a botanist, but a keen conchologist, I became more and more interested in shells, and as I only very occasionally visited the seaside, I decided to collect our British land and freshwater shells.

Ultimately I commenced to make a collection of the foreign species, as I was offered many in exchange for the British ones that I sometimes got in quantity.

One of my earliest finds was a pond, now filled up, near the corner of Withington Road on Wilbraham Road, in Chorlton-cum-Hardy, where I found *Planorbis spirorbis* and *Limnæa glabra* in very good condition. Subsequently I often found these two species together, both in ponds and ditches. I offered these through the exchange column of "Science Gossip," which was then a noted magazine for exchanges, and soon had many replies, as *L. glabra* seems to be very local, although plentiful in the neighbourhood of Manchester. Amongst the earliest people with whom I exchanged were Mrs. Fitzgerald, of Folkestone, and her sister, Miss F. M. Hele, of Bristol, both early members of this Society.

Whilst on the subject of *P. spirorbis*, I may say that, in my experience, this species is more often found distorted than any other species of *Planorbis*. I have collected specimens from a ditch near Platt Church, Rusholme, a locality now built over, but the most remarkable ones I know were found by Mr. A. G. Stubbs in a ditch at Tenby.

As I often went to Southport on business, when my work was done I went off to the outskirts of the town collecting, having a small dredge in my pocket, and a short stick in my samples. In a ditch at Blowick I found a considerable quantity of *Limnæa palustris* and *Aplexa hypnorum*, and amongst the former a beautiful specimen of the var. *albida*; but I did not know this until I came to clear off the green confervoid growth which virtually covered the shell. I recorded this (*J. of Conch.*, i., p. 139), as I found only one previous this has shrunk, it shews how well the damaged portion has be[illegible] covered over.

Named varieties of *H. nemoralis* are sometimes found in conside[illegible]able quantities in restricted areas; my friend, Mr. C. E. Wright, found many specimens of the var. *citrinozonata* on a railway bank, near Kettering, and the same variety is also found in quantity at Carrickfin, in North-west Donegal. The var. *olivaceozonata*, found by Dr. Chaster and myself at Magilligan Strand in Derry, was confined to a very small area of a few square yards.

I have been fortunate enough to find a few reversed specimens, including one of *H. nemoralis* var. *libellula* 00000, at Gleninagh, near Ballyvaughan, Co. Clare; and another, also *libellula* 12345, at Corbeyrier-sur-Aigle, Vaud, Switzerland; both were found in old stone walls. The first year that I went to Croyde Bay, walking over the hill to the Putsborough end of Woolacombe Bay, the very first shell that I picked up was a reversed *H. caperata*, dead, but in good condition. The most interesting find, however, was a reversed *Acicula lineata*, amongst a lot of small shells I brought home from a rainwash on Tramore Strand, North-west Donegal—only the second specimen recorded from the British Isles. This rainwash was a most extraordinary sight. Our party was staying at Dunfanaghy, and a day or two after our arrival it began to rain heavily, and as it rained for thirty-six hours every place was flooded, so much so, that the magistrate who was staying in our hotel, and who went off to the station, some four miles away, to go on to Gweedore, had to return, as the road was four feet deep in water. On the weather clearing up, we went off to Tramore Strand, a large stretch of sand dunes, some as high as 300 feet, connecting Horn Head with the mainland. Evidently the very heavy rain had formed a small pond, some twenty yards across, and had brought down large quantities of shells, most of them evidently from very old shell pockets, probably of Holocene age. The water had at last run away, but round the high-water mark there was a deposit of hundreds of thousands of dead and broken shells. Amongst the recent shells were large quantities of broken and immature *H. nemoralis*, *H. itala*, and *H. barbara*, but it was the extraordinary quantity of the smaller species that surprised us; there were *V. crystallina*, *V. pura*, *E. fulvus*, *P. pygmæum*, *Sp. edentulum*, *A. aculeata* and var. *albida*, *V. pulchella*, *C. lubrica*, *P. anglica* and var. *alba*, *P. cylindracea* and var. *albina*, *P. muscorum* and var. *albina*, *V. substriata*, *V. pygmæa*, *V. pusilla*, *V. angustior*, *Cl. bidentata*, *C. minimum*, *Ovatella bidentata*, and *Acicula lineata*.

Some species are occasionally found in very unlikely places. My finest and largest specimens of *B. perversa* are from a wall bounding the railway station at the commencement of Peel Road, Douglas, Isle of Man, virtually in the town itself. I have specimens of *L. peregerr* from a very unusual situation, given to me many years ago by Mr. F. C. Long, of Burnley (*cf.*, "Science Gossip," Dec., 1888), who found them in the mill cistern of the Gannow Weaving Shed, on the top of the engine house, about sixty feet above the canal from which the water was pumped. This water was kept at an equal temperature all the year round, and when they were cleaning out the cistern he found, besides these very *Succinea*-like *L. peregerr*, *S. corneum*, *S. lacustre*, *V. piscinalis*, *B. tentaculata*, *P. albus*, *P. corneus*, *P. nitidus*, *P. glaber*, and very fine *P. dilatatus*, although this species was only small in the canal. *Acanthinula lamellata* I have found in considerable quantities on dead leaves under holly bushes near Torc Waterfall, Killarney. *Acicula lineata* was also plentiful in the same situation.

Many species are found at times climbing bushes and trees, as at Lisdoonvarna Spa, in Co. Clare, on a very mild and damp day, I found quantities of *H. nemoralis* high up in a thorn-hedge by the roadside, in great variety of colour and banding. Also *H. pomatia* I have seen high up in the apple trees in Switzerland, far higher than one could reach with a long pole. *Pupa anglica* is generally found in damp situations, and from my experience the damper the place the darker the shell; but in the grounds of the old Bishop's Palace, at Parknasilla in Kerry, I found the var. *alba* climbing trees as far as I could reach. A good place to look for some of the *Vertigos* is on small fallen branches of trees in woods.

Some species are often found in very large quantities, such as *H. pisana* at Tenby, where you can easily collect hundreds in a few minutes; *Clausilias* are usually very numerous, as at Bellagio on Lake Como, I got several hundred *Cl. itala* and *Pupa avenacea* along a wall by the side of the lake. Once, when staying at Pensarn in North Wales, my children had a prize offered for the largest number of *P. muscorum* which were to be found under stones on the grass, just above high-water mark, and on one stone, no larger than one's hand, they found as many as forty-five specimens. When staying at Gryon in the Rhone Valley I found some species in very large quantities, especially *Clausilia* and *Pupa* on both walls and trees, and on one day, after heavy rain, I found over fifty specimens of *C. laminata* var. *albina* on some railings near the village. *H. arbustorum* and *H. villosa* were also very plentiful in the narrow gorges of the river Avençon, but one species, *Eulota fruticum*, I only found singly, although it was by no means rare and could easily be seen if crawling, by the yellow colour of the animal showing through the white shell.

If you examine the full-grown shell of *H. pomatia* you may have noticed that the growth is often very irregular, through the mouth having been damaged before maturity. This I think is caused by this species being very timid and easily frightened. It readily drops off the bush or tree, or even rolls down a steep bank, and the animal being heavy causes the edge of the mouth to be damaged.

Habitat has a very considerable influence on the size of a shell. I have noticed this most in the west of Ireland. The *H. nemoralis* on Inishmurray were very large—the largest Irish specimens I have taken, but rather thin, although the island is purely limestone; but on the mainland opposite at Streedagh Point they were quite small but much thicker and stronger shells. *H. itala*, however, is the species that I found to vary most in size; very large from Mungret near Limerick, and very small ones, but full-grown, from Loonah Point, Co. Mayo, and from Salthill, a suburb of Galway, where they were in large quantities on a grassy bank without any cover.

The mark on land shells showing where the specimen stopped growing previous to hibernation is generally easily seen, but this is not so often noticed in freshwater shells; but where you find a thickening, as on *L. stagnalis* var. *variegata*, showing a repetition of white marks or ribs, it is caused mainly through drought during the growth period. Occasionally shells are found that vary much in colour after hibernation, and I have collected at Manorbier a full-grown *H. hortensis* which commenced a pure white, but after hibernation completed the shell with the ordinary yellow colour.

Pairing of two distinct species has occasionally been noticed, as of *H. nemoralis* and *H. hortensis*, but I have one specimen that I took at Bundoran which I think is a cross between *H. nemoralis* and *H. itala*, as it has the distinct five bands of *H. nemoralis*, but the wide open umbilicus of *H. itala*, and is much flatter than the ordinary *H. nemoralis*. In some places I have found large quantities of shells of *H. nemoralis* recently dead, but quite cleaned out, especially once when I was staying in Monsal Dale, and this I think was caused by glow-worms, as I saw many of these, late at night, on the bank where the dead shells were to be found.

Some species of land and freshwater shells are found at very high altitudes. I have myself collected at Arolla, at over 7,000 feet, and above the zone of the noted Arolla pine, *Pyramidula rupestris*, *P. ruderata*, and *Euconulus fulvus*. Also near Arolla, at 7,500 feet, *H. arbustorum* var. *alpicola*. The snow very seldom melts there before the end of June, and I collected the shells in July, when the whole mountain side was covered with a luxuriant growth of wild flowers. Land shells have, however, been found in the Andes up to

14,000 feet, and freshwater shells in the Himalayas at 16,000 feet.

At Rhos, near Colwyn Bay, on the sea front before the present road was made, I found a thrush stone with not only the usual *H. nemoralis*, etc., but large strong shells of *Littorina littorea* all broken in the same way.

A few years after I began to collect, it was reported that *Hygromia villosa* had been found alive at Cardiff. Mr. Rogers and I went down in 1883 to try and find out if this was correct. We could not find any trace of this species, but we did find dead shells of *H. carthaginiensis* and *H. lactea* on the East Moors, where the ballast was tipped. Whilst in South Wales we went on to Swansea to ascertain if the colony of *H. pisana*, planted before 1862 by Jeffreys, was still in existence. We found the species quite common, especially near the starting-place of the old tram-line to Oystermouth and in considerable variety, but since then I understand the colony has almost died out. I brought a considerable quantity of them alive, and planted them in a sunny position at Monsal Dale, but the experiment did not succeed, as there were none to be found two or three years later.

H. aspersa has been introduced, and seems to be able to adapt itself to many different localities all over the world. I once wrote to one of my brothers, who was then living at Sea Point, near Cape Town, to send me any land shells he could. Shortly after a box arrived, containing nothing but *H. aspersa*, collected in his garden. I have also had them sent alive from Australia.

Many species, especially *V. pulchella*, are found at the foot of old walls, but for many of the smaller species it is a very good plan to have a calico bag, and fill it with moss and dead leaves. These, if collected in woods, especially under beech trees, generally yield a good result. They soon dry after being spread out and turned over occasionally. By this method I have taken many species of *Vitrea*, also *E. fulvus*, *V. pellucida*, *A. aculeata*, *A. lamellata*, *P. pygmæum*, and various species of *Pupa* and *Vertigo*. *Carychium minimum* is the commonest species, often in very large quantities.

When making a collection of shells, it is very important to extract the whole of the animal, as if this is not done the specimens do not look so well in the cabinet, and, also, they are not so easily examined for their critical differences. This is not always possible, especially in the smaller species, but with care all the *Vitreas* can be completely cleaned out, and some of our members are able to do this, even in the case of *V. crystallina*, *V. radiatula*, and *E. fulvus*. It is very important to keep the water boiling, but not fiercely, and for the smaller species only to immerse them for a few seconds. Mr. A. G. Stubbs published "Hints on Cleaning," in 1900, and this has been very useful. It is very important to have the shells thoroughly dry, especially if any part of the animal is left inside, before placing them in the cabinet, otherwise they are very liable to shew signs of damp, causing a small fungus to grow, which will sometimes spread to specimens looking perfectly clean. It is also important to see that no dirt or animal matter is left in the suture or umbilicus, as this will easily start the trouble, so I invariably wash the shells in lukewarm water and clean them with an old tooth-brush. A needle fastened to a holder will always help when the matter is very dry. The larger species of land shells are easily cleaned if the water is quite boiling, but too many should not be attempted at one time. If the animal has retreated far up the shell, it is better to damp them, and let them be on the crawl, before putting them in the water. Freshwater shells are also easily cleaned. In the case of *Pisidium* it is best to take out the animal when the shell is open, and screw up carefully in thin tissue paper till dry. In operculated species it is important to detach the operculum, and when the shell is dry, place it in position, backed by a little cotton-wool, and fasten it with gum or coaguline.

Having got the shells, the next question is how to mount them for the cabinet. Many plans have been adopted. Some of the old collectors used wood or card tablets, but this necessitated some form of gum or glue, and often ruined the shells. Morelet used card tablets, but his adhesive did not seem to damage the shell at all. On the top of the tablet he wrote the name and author of the species, and the locality at the bottom ; on the back he always put the name of the person from whom he had received them, and also the date, and very often some remark, but if he had collected the specimens himself he simply wrote " Mihi." Some shells that I bought at " Stevens" many years ago, evidently from a very old collection, were loose in trays, with the name of the species and the locality written on a cardboard label, and at the back of the label the name of the dealer from whom they had been bought, *e.g.*, Humphreys, 27th Nov., 1810. Mawe, 23rd Feb., 1811.

My old friend Rogers mounted most of his shells on glass tablets, so that on turning them over you could see the underside of the shell without taking it off. For some time I followed his example, but there are many objections to this plan, as it takes up a great deal of room, and if one is not careful, one glass may slide over another. Another plan for mounting the smaller species is to fasten them on a card, and place it in a glass tube ; but the glass gathers moisture, and the lines made on the glass when the tube is drawn shew sometimes very much. The best plan I have so far adopted for mounting the smaller species is in round glass topped boxes, on blue or white cotton-wool as preferred, with the name of the species and the locality written on the bottom of the box, and for specimens personally collected the date as well. For specimens bought or exchanged, I always put the label received with them at the bottom of the box under the wool.

A year or two before he died, I bought from Mr. Ponsonby the whole of his *Enidæ*, and in most cases he had written under the locality the name of the person from whom he had received the specimens, *e.g.*, from Canon Tristram, Tiberi, Debeaux, Hidalgo, Ancey, Fruhstorfer, etc.

Some collectors mount most of their shells in square glass-topped boxes, and this is certainly a good plan, as you can so easily take out a few species for exhibit at a meeting, but it is rather expensive, and instead I had my cabinets made with glazed drawers, and put my shells in open trays, say from about the size of our *H. hortensis.* At first I lined the bottom of the tray with blue cotton-wool, but I found this unsatisfactory, as one often pulled up some of the wool with the shell, so I now line the tray with blue flannel or blue union. I put a card label across the bottom of the tray, tight enough not to be moved when the drawer is pulled out, and the original label, if any received, in the mouth of the shell, and plugged in with a little cotton-wool. As regards the size of the trays, I have found the one I originally started with extremely convenient. The most useful outside measurements are 3″ × 1½″, 3″ × 2″, 3″ × 3″, 3″ × 4″, and a few 4″ × 4″ and 6″ × 6″, and all half-inch deep. Any of these can easily be divided by putting a strip of card down the centre, a far better plan than having smaller trays, and very useful when one has only single specimens to mount. Some sizes of trays suit admirably for keeping the small round glass-topped boxes in position, the 3″ × 4″ will hold nine boxes of 1″ diameter, or six of the 1¼″, while the 4″ × 4″ hold nine of the larger size. The drawers of my cabinets I had made 18¼″ × 18¼″ inside measurements, so as to take the 3″ trays across and allow a little play, as the trays are not always quite true to size. By mounting your shells in this way, you can so easily replace a poor specimen.

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BRACHYPODELLA NIDICOSTATA nov. sp. FROM VENEZUELA.

By GEO. C. SPENCE.

(Read before the Society, September 10th, 1910).

Brachypodella nidicostata nov. sp.

Shell dextral, cylindric or swollen in the middle, the upper thir tapering to a narrow truncation. Surface golden brown with a slightly silken lustre and very delicately ribbed or waved between elevated, sickle-shaped, snow-white hollow ribs, which are convex on the right and concave on the left side when entire, but are usually broken and showing the ground colour between the laminæ forming the rib. Whorls remaining vary from eleven to thirteen, convex, with a sulcus above the deeply impressed suture. Last whorl strongly keeled, descending in a moderately long neck, swollen on the outer side and encircled with white ribs or laminæ, becoming more crowded at the back of the expanded mouth. Aperture obliquely ovate, angled at the base and outer anterior portion. Peristome broadly expanded, brown, fading to white on the expanded portion. Axis slightly twisted and encircled with a single smooth strong spiral lamella.

Size (type) 16 mm. × 3 mm., thirteen whorls remaining.

Habitat, Chichirivichi, Venezuela.

I am indebted to Mr. F. G. Percival, B.Sc., F.G.S., for these shells, which he collected in May, 1910, from a vertical limestone cliff.

The specific name is suggested by the resemblance of the white ribs, when perfect, to the edible nests of the swift (*Collocalia linchi* Horsfield) from Borneo.

Type in my collection. Co-types in Natural History Museum, South Kensington, and Manchester Museum.

This is erroneously recorded as *Brachypodella leucopleura* in the Proceedings of June 18th Meeting.

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Correction.—In my Obituary Notice of the late Canon Norman, F.R.S., I mentioned that his collections had been "generously bestowed by him upon the nation." I am indebted to Mr. G. C. Robson, of the British Museum (Natural History) for explaining the exact facts of the case, viz., that these collections, numbering altogether over fifty thousand specimens, were purchased in four instalments by the museum authorities, viz., in 1898, 1900, 1910, and 1911–12 respectively, a large sum being paid. Mr. Robson adds, that it would be difficult to give an exact account of the Canon's donations, but they would appear to be small in proportion to the purchases.—J. C. MELVILL.

FOUR NEW MARINE SPECIES FROM SOUTH AFRICA.

By J. R. Le B. TOMLIN, M.A.

(Read before the Society, December 10, 1919).

Bullia tenuistriata sp. nov. (f. 4).

Shell elongate-conic, cream-coloured or whitish; whorls about seven in number, increasing rapidly, with a protoconch of two glassy, semitransparent and apparently quite smooth whorls; the other whorls are marked by close, equal, and equally-spaced spiral ribs, of which there are seventeen on the penultimate whorl of the type, and about fifteen on each of the two preceding ones; interstices between the ribs smooth; sutures strongly marked and deeply impressed; aperture elongate oval, channelled anteriorly. Length, 16·5 mm.; diam. max., 6.5 mm.

Length of aperture, 6·5 mm.

Hab., Port Alfred (two specimens).

Type, in coll. Turton.

In general appearance this shell bears some slight resemblance to *pura* Melvill, but is easily separated from all South African Bullias by the sutures, which give it almost a scalariform appearance.

Columbella apicibulbus sp. nov. (f. 2).

Shell minute, cylindrical, whitish, transparent, with traces of fine axial hair-like lines under a high power; whorls 4½, with a curious bulbous protoconch, the fourth whorl from the base being much dilated; sutures moderately impressed and marked by a white line; aperture very narrow and almost wedge-shaped; last whorl very slightly broader than the rest of the shell, which is very nearly of equal breadth throughout; columella and anterior end of shell sharply truncate. Length, 2 mm.; diam. max., 0·8 mm.

Hab., Port Alfred (two specimens).

Type, in coll. Turton.

The protoconch reminds one in miniature of that of *Voluta mamilla* Gray.

Cylichnella bistriata sp. nov. (f. 1).

Shell white, cylindrical throughout, with spire submerged; apex concave, with two strongly incised spiral lines encircling it outside; there are also traces of distant spiral sculpture on the body whorl, which become distinct at the anterior end; aperture narrow; outer lip projecting above somewhat angularly; columella sloping but very slightly curved. Length, 3 mm.; diam. max., 1·4 mm.

Hab., Port Alfred (one).

Type, in coll. Turton.

A narrow elongate shell distinguished from the other South African members of the genus by the two striæ at the posterior end. The figure makes the shell and aperture too broad.

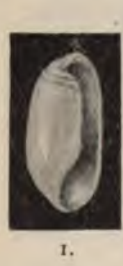
Marginella walvisiana sp. nov. (f. 3).

Shell very closely allied to *M. capensis* Krš., but larger, of a much more solid and opaque texture, with a more acuminate spire. It is rather differently proportioned, being broader in proportion to length, and has a very much broader aperture, especially anteriorly. The outer lip is strongly thickened and arcuate; colour pale brown with faint traces of bands. Length, 16 mm.; diam. max., 8 mm.

Hab., living at Walvis Bay (Burnup).

Type, in British Museum.

Nine specimens of this species are before me, all exactly similar, except that three are an albino variety—as well as typical examples of *capensis* collected at the same time. *M. ambigua* Bavay is a somewhat similar shell, but nearer to *capensis*.



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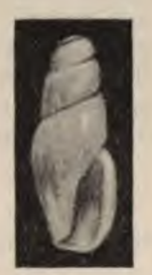

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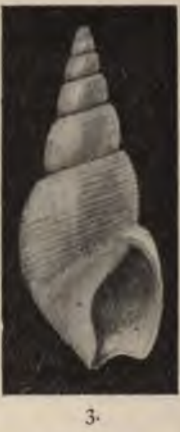

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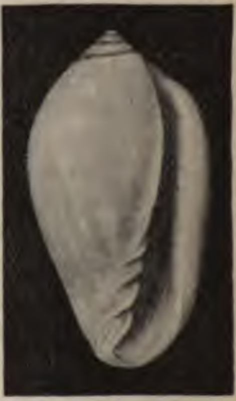

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J. D. Dean *del.*

THE MARINE MOLLUSCA OF SUSSEX.

By R. WINCKWORTH, M.A., F.R.G.S.

(Read before the Society, December 13th, 1916).

THE two principal localities whence these records have been obtained are the foreshore at Black Rock, Brighton, which is of chalk, and the coast within a few miles of Eastbourne, where I have dredged in shallow water of seven to fifteen fathoms over bottom of considerable variety, sand, shellsand, broken shell, mud, gault clay, mussel beds, and brusk. My Brighton dredgings have so far not been so successful; considerable areas consist of hard chalk, and it is a four miles pull to get to the ten fathom line. Many of these records are new for Sussex, a coast which seems to have been very little studied, if we except the work of the Hastings Natural History Society. Yet the district is an interesting one, and fairly rich in life, as the seventy-three species recorded for the foreshore alone shew.

Among the more interesting records is *Acanthochiton discrepans* (Brown), usually regarded as a Channel Island species. There is also a large colony of this species off Bembridge in the Isle of Wight, where I have dredged some thirty specimens in four to five fathoms. To these localities Brighton may now be added. Another shell usually associated with the western part of the channel is *Lepton squamosum* (Montagu), single valves of which I have dredged several times off Brighton and Eastbourne. So also *Pandora inæquivalvis* (L.), seems to be not uncommon at Bracklesham, and I have worn valves washed ashore from near Dungeness. Further exploration of Hampshire and Sussex shores may well bring records of other western channel species.

In the following list I have used the nomenclature of the Conchological Society's List of 1902, and abbreviations are as under:—B.R. denotes records from the shore at Black Rock, Brighton; B. denotes dredgings at Brighton; E. denotes dredgings at Eastbourne.

AMPHINEURA.

Craspedochilus onyx (Spengler).—Common on shells and stones, E.

Craspedochilus cinereus (L.).—Plentiful, B.R.

Acanthochiton fascicularis (L.).—Not common, B.R.; Seaford.

Acanthochiton discrepans (Brown).—Two fine specimens at extreme low water under stones, B.R., 27 Sep., 1912, and 30 Sep., 1913. The larger was 1″ 3 × 0″75. It is not surprising that an occasional individual of this species should appear, seeing they are to be found plentifully off Bembridge, Isle of Wight.

PELECYPODA.

Nucula nucleus (L.).—Single valves common, E.; B.R.; Rye Bay.
var. *radiata* F. & H.—Several living, 10f., E.; valves, B.

Nuculana minuta Müller.—Valves common, E.

Anomia ephippium L.—Young living on stones, B.R., large shells sometimes washed ashore. Small aculeate and cylindrical varieties occasionally in roots of *Laminaria*.

Barbatia lactea (L.).—Valves common, E.

Mytilus edulis (L.).—Everywhere, Selsey to Rye. The largest mussels come from the river Adur at Shoreham. Occasional specimens from B.R. are light yellow in colour, and many are glossy and beautifully rayed.

var. *galloprovincialis* Lam.—Not uncommon singly, B.R.

Volsella modiolus (L.).—Fresh specimens occasionally, Rye Sands and Bracklesham Bay.

Volsella barbata (L.).—Roots of *Laminaria*, B.R.

Volsella adriatica (Lam.).—A single living specimen, 12f., E.

Modiolaria marmorata Forbes.—5f., B.; valves, E.

Ostrea edulis L.—Everywhere. At Selsey, they occur not in regular beds, but scattered over a wide area in small numbers; these oysters are said to have originated in the wreck of a schooner bringing Caen Bays to Southampton. The Shoreham oyster beds consist chiefly of Portuguese (*O. angulata* Lam.) with some *O. edulis* and Americans (*O. virginica* Gm.).

Wild oysters are occasionally found at B.R. on chalk and flint, and I have twice found var. *parasitica* Turton glossy, greenish, and rayed, once on chalk, and once on *Mytilus edulis* at B.R.

Pecten maximus (L.).—Valves, B.R., etc.; young living, E.

Pecten pusio (L.).—Valves, B.R.

Pecten varius (L.).—Valves, all beaches; living, 12f., E.

Pecten opercularis (L.).—5f., B.; 7f., E.; valves, all beaches.

Goodallia triangularis (Montagu).—Several dead in shell-sand, E.

Loripes lacteus (L.).—Shells common Littlehampton Sands and Bracklesham Bay. I have found scores of living *Loripes* on the shore at Bembridge opposite Bracklesham.

Lucina borealis (L.).—Occasional valves, B.R.

Tellimya ferruginosa (Montagu).—Dead 8f., B.

Diplodonta rotundata (Montagu).—One worn valve, E.

Kellia suborbicularis (Montagu).—Dead, 12f., E.

Lepton squamosum (Montagu).—Valves, 7, 10, and 12f., E.; 8f., B.

Lepton nitidum Turton.—Valves and one living, 12f., E.

Lepton clarkiae Clark.—A few, 18f., E.

yndosmya prismatica (Montagu).—Single valves only; 9f., B.; 10f., Seaford; 12f., E.

yndosmya alba (Wood).—Plentiful in 5f., B. and 10f., E. and Seaford. One living in coralline at low water, B.R.; living in sand, low water, Rye Bay.

crobicularia plana (daC.).—I have not yet found this living, though the shells are plentiful enough in the mud at Aldrington and Newhaven. Those from Bracklesham Bay are undoubtedly Pleistocene fossils.

Tellina tenuis daC.—Plentiful in sand with *Donax*, Rye Bay; dead, B.R., etc.

Tellina fabula Gron.—A few living, Rye Bay; dead, B.R., etc.

Macoma balthica (L.).—A decorticated white variety is common in mud at Aldrington; while var. *carnaria* Pennant is plentiful in sand with *Donax* in Rye Bay. I found also a single living specimen at Aldrington, which I refer to var. *nivea* Jeff.

onax vittatus daC.—These can be gathered by hundreds living in and on the sand in Rye Bay; also Seaford; and 1f., E. Valves, B.R.

actra stultorum L.—Valves everywhere. In numbers alive at mouth of Rother, Rye Bay, on one occasion. Young common, 9f., B.

bisula subtruncata (daC.).—Fresh, though not living, B. and E.

bisula elliptica Brown.—Common, 12f., E., and 8f., B.

enus verrucosa L.—Worn valves and one young living, 12f., E.

enus ovata Pennant.—Common, 10—12f., E.

enus gallina L.—Worn valves, Wittering.

apes aureus (Gmelin).—Fairly common in muddy gravel, Aldrington, mostly var. *ovata*.

apes virgineus (L.).—B.; E.; mostly dead.

pes pullastra (Montagu). — Everywhere ashore; occasionally dredged alive, once in 12f., E. The var. *perforans* is plentiful at B.R., chiefly in *Pholas* holes.

pes decussatus (L.).—In numbers among muddy stones, Aldrington, and gathered for food as 'Butter-fish.'

ardium echinatum L.—Valves common everywhere; perfect, though not living, specimens from Rye Sands.

ardium exiguum Gmelin.—One living at low water, B.R. Valves E., and Selsey. It is common living in 4f. at Bembridge.

ardium nodosum Turton.—Valves common, E.

ardium edule L.—

Cardium norvegicum (Spengler).—Valves everywhere; young living, 12f E.

Mya arenaria L.—Common, Aldrington, both type and var. *lata* J. Sow.

Mya truncata L.—Dead, E., and Rye.

Sphenia binghami Turton.—In chalk at low water, twice, B.R.; also 4f., B., and 12f., E.

Corbula gibba Olivi.—6f., B.; 7—12f., E.

Cultellus pellucidus (Pennant).—Fairly common living 6 and 8f., B.; 10f., Seaford; and 12f., E. Shell, B.R.

Ensis ensis (L.).—Shells everywhere, shore and dredged, especially 8—9f., B.

Ensis siliqua (L.).—Not common. Shells of type from Bracklesham and one var. *arcuata* Jeff., E.

Solen vagina (L.).—Shells not uncommon, Rye and Selsey.

Saxicava rugosa (L.).—Plentiful in *Pholas* holes in chalk, B.R.

Gastrochæna dubia (Pennant).—In a piece of chalk washed ashore, Brighton.

Pholas dactylus L.—All four piddocks may be found living from middle to low water in the chalk at Brighton, but this is the most abundant. Also in sandstone, Bexhill. Valves, Bracklesham.

Barnea candida (L.).—In chalk, B.R.; in sandstone, Bexhill. Valves, Bracklesham.

Barnea parva (Pennant).—In chalk, B.R.; in sandstone, Bexhill.

Zirphæa crispata L.—In chalk, B.R. Valves, Bexhill.

Teredo navalis L.—Valves and tubes of adult and young living specimens in oak, probably from local breakwater, Seaford, Dec., 19[illegible]3.

Pandora inæquivalvis (L.).—Shells common, Bracklesham sands; two valves from near Dungeness: 8 and 9f., B.; dead, 6f., E.

SCAPHOPODA.

Dentalium vulgare daC.—Plentiful, living 9f., B.; and 7—12f., E. Shells, B.R.

GASTROPODA.

Patella vulgata L.—Largest 2″·6 × 2″·1, height 1″·5, near high-water, Tetscombe Cliffs.

Helcion pellucidum (L.).—Common, B.R.

Acmæa virginea (Müller).—Under flints, B.R.

Emarginula conica Schumacher.—Shells only 7 and 12f., E.

Fissurella græca (L.).—Shells only, Bracklesham sands; 5f., B.; and 12f., E.

Gibbula magus (L.).—Shells only, B.R., etc.

Gibbula tumida (Montagu).—In 12f., E.; and shells 7f., E.

Gibbula cineraria (L.).—

Calliostoma zizyphinum (L.).—Common at extreme low water, B.R. ; 6—9f., B. ; 7—12f., E.

var. *lyonsi* Leach.—12f., E.

Phasianella pullus (L.).—Not uncommon on *Chrondrus crispus*, B.R. ; also 12f., E., on *Flustra foliacea*.

Lacuna crassior (Montagu).—Living, 12f., E.

Lacuna divaricata (Fabr.).—Not uncommon on *Laminaria digitata*, B.R.

Lacuna parva (daC.).—Sometimes common on Carrageen and Dulse, B.R., both yellow and banded specimens.

Lacuna pallidula (daC.).—Common on *Fucus serratus* and *Laminaria digitata*, B.R. Also var. *patula* Thorpe, and one var. *patula-albescens* on *Fucus serratus*, B.R.

Littorina obtusata (L.).—

Littorina neritoides (L.).—In some numbers along about ten yards of brickwork, B.R. I have not met with it anywhere else in Sussex.

Littorina rudis (Maton).—Sandstone, Hastings ; cemented flint and brickwork, Brighton ; mud, Aldrington.

var. *saxatilis* Jeffreys nec Johnston.—On Brighton groynes.
var. *tenebrosa* (Montagu).—The Hard, Bosham.
? var. *globosa* Jeffreys—Aldrington.

Littorina littorea (L.).—

Rissoa parva (daC.).—Abundant in fine weeds, especially *Polysiphonia* and *Plocamium*, B.R. The var. *interrupta* occasionally occurs with the type.

Rissoa violacea Desmarest.—One, 12f., E.

Manzonia costata (J. Adams).—One, B.R. ; two, 12f., E.

Zippora membranacea (J. Adams).—Aldrington and Emsworth.

Onoba striata (J. Adams).—Shells only, rare, B.R. ; and plentiful, 12f., E.

Cingula semistriata (Montagu).—Fifty shells in 12f., E.

Galeodina carinata (daC.).—One shell in 4f. between Selsey and Bembridge.

Paludestrina stagnalis (Baster).—Aldrington ; Newhaven ; Bosham.

Paludestrina ventrosa (Montagu).—Plentiful in Rye marshes.

Adeorbis subcarinatus (Montagu).—Several shells, 12f., E.

Crepidula fornicata (L.).—Emsworth ; Selsey ; Shoreham.

Trivia europæa (Montagu).—Not uncommon, B. and E. I have twice found it living at low-water, B.R.

Natica catena (daC.).—Living, Rye sands, and 10f., Seaford ; shells, B.R. ; spawn coils, Rye sands ; and one 5f., B.

NOTES ON THE ANATOMY AND REPRODUCTION OF PALUDESTRINA STAGNALIS.

By CAPT. H. E. QUICK, M.B., F.R.C.S.

(Read before the Society, October 18, 1919).

The following notes on *Paludestrina stagnalis* make no pretence to completeness, but Prof. Boycott's discovery of Parthenogenesis in *P. jenkinsi* (*J. of Conch.*, xvi., 2) makes the record of the condition in allied species of interest.

The ovary occupies the upper whorls of the spire lying superficially between the body wall and the liver. The thin-walled oviduct follows the convexity of the body whorl. Its lower portion is thicker and lined by cubical ciliated cells, and runs with the rectum to open within the mantle cavity close to the anus.

The testis occupies the middle whorls of the spire. The vas is a thick walled tube, lined by cubical ciliated cells, and appearing as if convoluted and twisted on its own axis.

The penis is relatively large and mobile, arising from the right dorso-lateral body wall beneath the mantle margin. When fully extended it reaches beyond the base of the right tentacle. Beneath the epithelial covering is a coat of longitudinal and then a coat of circular muscle fibres. The areolar tissue of its interior is traversed by a narrow ciliated duct, which is thrown into folds when the penis contracts. The terminal fifth of the lumen is non-ciliated. The mobile spermatozoa can at times be seen issuing from the terminal orifice.

In this district *P. stagnalis* inhabits Swansea beach near high water mark, Parkmill estuary, and Oxwich salt marsh. At Parkmill the shallow pools are only flooded at spring-tides, after which their muddy floors are crowded with *P. stagnalis*. During neap tides the pools dry up in summer, and the mud floors become fissured.

On Aug. 7th, 1919, after a fortnight's drought, numerous *P. stagnalis* were found semi-dessicated at the roots of the short grass and thrift on the edges of the dry pools. Placed in brackish water they immediately became active, and on Aug. 16th a clutch of twenty-five eggs in a gelatinous envelope was seen on the side of the vessel. These eggs hatched as free swimming veliger larvæ on Sept. 9th. An individual of this group proved, on dissection, to be a male, with active spermatozoa.

The eggs capsules are frequently found attached to the shells, and coated with small sand grains. They are laid from May to August, and very likely at other periods.

The proportion of males to females cannot be determined, as a considerable number are infected by the cerceriæ larvæ of a parasitic trematode. This was first pointed out to me by Mr. G. C. Robson for a group of *P. stagnalis* from Oxwich, viz., forty-eight out of fifty; and I have since found the condition, though in a much smaller proportion of cases, in Swansea Bay specimens. The parasites occupy the site of the gonad, and the remainder of the genitalia usually cannot be traced, though one of the specimens had a well developed penis. The larger and more tumid individuals that are definitely sexed, however, are females, and the smaller more compressed shells contain males.

In both sexes a pallial tentacle arises just within the right mantle margin, and is protruded during locomotion. In both sexes the left cephalic tentacle is thicker than the right, and presents a crenulated outline. The cilia are concentrated in the constrictions. The right tentacle is smooth and uniformly ciliated. Both have a pigmented ring, a short distance below the apex.

As to salinity of water, the Swansea Bay *P. stagnalis* live in practically pure sea water. At Oxwich, during neap tides, the fresh water oozes into the pools, and a sample on analysis gave 1·59% NaCl, *i.e.* about 60% sea water. During rain and neap tides the proportion of NaCl must be much less.

P. jenkinsi lives at Oxwich in 0·035% NaCl, and at Llanrhidian in 0·19% NaCl, but these sites are inundated at the highest spring tides for a short time. A group of *P. jenkinsi* placed in 33% sea water on July 6th, 1919, is still active on Sept. 13th.

Compared with *P. jenkinsi*, the main points that stand out are the occurrence of males and females, the laying of eggs, and the earlier stage of development at birth, viz., veliger larvæ; the tentacular asymmetry, the presence of a pallial tentacle, the frequency of infection by a trematode (*P. jenkinsi* from within a hundred yards of the *P. stagnalis* are free from it), and the tendency of *P. stagnalis* to the sea side of brackish water, and of *P. jenkinsi* to the fresh water side.

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Parthenogenesis in Paludestrina jenkinsi from Brackish Water.—Following up Prof. Boycott's note on Parthenogenesis in freshwater *P. jenkinsi*, four individuals, 1 mm. long, from Llanrhidian Marsh, 0·19% NaCl, were isolated with all precautions on June 28th, 1919, and the vessels frequently searched with a lens for accidentally introduced new born young, with negative results. On Sept. 5th vessel A had one infant, Sept. 8th three infants, Sept. 12th five infants. Vessel C, Sept. 7th two infants, Sept. 12th three infants. The mother C was then examined, and on dissection contained thirty embryos in all stages of development.—H. E. QUICK. (*Read before the Society*, October 18th, 1919).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND

484th Meeting, held at the Manchester Museum, Sept. 10th, 1919.

The President (Mr. E. Collier) in the chair.

New Members Elected.

Frederick Stanley. Francis J. Ede.

Candidates Proposed for Membership.

Walter Cartwright, 4, Leek Road, Buxton (introduced by W. E. Alkins an Maurice Cook).

Eric Wolfe Jones, 5, Chandos Road, Heaton Chapel, Stockport (introduce by E. Collier and R. Standen).

Resignations.

Joshua L. Baily, jr. H. P. W. Giffard.

Member Deceased.

Dr. G. H. Broadbent.

Members Struck Off the List (Rule IV.).

J. Chalmers and C. M. Standish.

Papers Read.

"*Brachypodella nidicostata* sp. nov., from Venezuela," by G. C. Spence.

"Note on *Conus chytreus* Melvill," by A. T. Hopwood.

Principal Exhibits.

By Mr. A. T. Hopwood: *Conus chytreus* Melv., to illustrate his note; als *Conus crocatus* Lam., from New Caledonia (MacAndrew Coll.), *Conus circumcisus* Born, Moluccas; *Sphærium lacustre*, from Cut Hole Aqueduct, Stretford, Manchester.

By Dr. W. T. Elliott: *Ostrea edulis* L. cemented to a pebble, from Anglesea.

By Mrs. Gill: *Conus planiliratus* Sow., *C. coccineus* Gm., and *C. nucleus* Lam.

In the Special Exhibit of *Streptaxis*, series were shown by Messrs. E. Collier, R. Standen, J. Ray Hardy, Mrs. Gill, and the Manchester Museum.

485th Meeting (Annual Meeting) held at the Manchester Museum, October 18th, 1919.

The President (Mr. E. Collier) in the chair.

Previous to the Ordinary Meeting, a Special Meeting was held at which the following resolution was adopted *nem. con.*:—

> "That in order to meet the increased cost in the production of the *Journal of Conchology* and other publications of the Society, for which the present income is inadequate, the annual subscription to the Society, for the year 1920 and after, shall be ten shillings, and the composition fee for life members six guineas; and that effect be given to the consequent alteration of Rule 4. Members elected prior to the passing of this resolution shall be invited to strengthen the financial position of the Society by voluntary adopting the increased subscription, but failure to do so shall not prejudice the standing of any such member."

The following members and friends were present:—Rev. Dr. A. H. Cooke, Drs. J. Cosmo Melvill, A. E. Boycott and W. M. Tattersall; Rev. E. H. Nash, Messrs. J. G. Kitchen, B. Bryan, C. H. Moore, A. T. Hopwood. A. K. Lawson, J. A. Hargreaves, J. R. le B. Tomlin, E. R. Brown, G. C. Spence, E. C. Stump, E. D. Bostock, J. R. B. Masefield, M. Cook, W. Cartwright, C. Oldham, F. Taylor, R. Harrison, A. J. E. Cave, R. Standen, G. H. Taylor, E. W. Jones, Miss D. Dimbleby, Mr. and Mrs. Gill, Mr. and Mrs. Wilfrid Jackson, Miss Jackson,. and Master Robert S. Jackson.

Donations to Autograph Collection announced and thanks voted:—

A large batch of autograph letters, presented by Mr. Hans Schlesch.

Donations to the Cabinet announced and thanks voted:—

An exceedingly fine collection of slides of Molluscan Radulæ, prepared by the late Rev. Prof. H. M. Gwatkin, and presented by Mr. Joseph Bliss.

Appointment of Auditors.

Messrs. C. H. Moore and E. R. Brown were re-appointed Auditors.

Appointment of Scrutineers.

Messrs. F. Taylor and A. T. Hopwood were appointed Scrutineers.

New Members Elected.

Walter Cartwright. Eric Wolfe Jones.

Candidates Proposed for Membership.

Arthur K. Lawson, Addison Road, Hale, Cheshire (introduced by Joseph G. Kitchen and J. Wilfrid Jackson).

Resignations.

Lady Lyons. J. T. Marshall.

Member Struck off the List (Rule IV.).

F. R. T. Lucas.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1919-1920 had been unanimously elected as nominated by the Council (see page 69).

Papers Read.

"Notes on the Anatomy and Reproduction of *Paludestrina stagnalis*," by Capt. H. E. Quick, M.B., F.R.C.S.

"Parthenogenesis in *Paludestrina jenkinsi* from Brackish Water," by Capt. H. E. Quick, M.B., F.R.C.S.

Presidential Address.

Mr. Edward Collier gave his Address on "Reminiscences and Practical Hints on Collecting."

A cordial vote of thanks was passed to the retiring President for his services.

The Society's best thanks were also voted to the authorities of the Manchester Museum for permission to hold meetings on their premises.

Exhibits.

By Mr. R. Standen: *Voluta sophiæ* Gray, Thursday Island; *Voluta hebræa* L., many forms, including var. *turbinata* Kiener; *Acroptychia metableta* (Crosse), Madagascar; *Placostylus ouveanus* monst. *sinistrorsa* Crosse, Ouvea, Loyalty Islands; *Limicolaria aurora* (Jay), Bumba, Belgian Congo; *Columbarium pagoda* Less., Japan; *Orthalicus deburghiæ* (Reeve) var. *gloriosus* Pfr. (ex coll. Henry

Adams)—collected by the celebrated lady traveller, Madame Ida Pfeiffer, on ban of River Amazon.

By Prof. A. E. Boycott : Sinistral *Ena obscura* from Danebury, near Stockbridge, Hants., July, 1918 ; *Clausilia biplicata*, showing various repaired injuries to the mouth region, two being bi-mouthed, Hammersmith, Middlesex, Sept., 1919; *Paludestrina jenkinsi* bred parthenogenetically through two generations.

By Mr. A. T. Hopwood : *Conus chytreus* Melv., *C. circumcisus* Born, *C. centurio* Born, *C. rhododendron* Couth., *C. caillaudi* Kiener, and *C. floccatus* Sow. --the last three being from the MacAndrew Collection. Also other fine species of *Conus*.

By Mr. J. G. Kitchen : Numerous species of *Urocoptis*, etc.

By Mr. J. Ray Hardy : Species of *Claviger*.

By Mr. F. Taylor : *Limnæa pereger* var., and *Aplecta hypnorum* from Denton, Lancs. ; *L. truncatula* from Freshfield, Lancs. ; and *Azeca tridens* from Romiley, Cheshire.

By Mr. C. H. Moore : Mollusca from Madeira.

By Mr. G. C. Spence : *Obeliscus* ; *Brachypodella*, etc.

By Mrs. Gill : Species of *Papuina*.

By Mr. E. Collier : Numerous species to illustrate his address.

By Mr. W. Cartwright : *Helix aspersa*, *H. hortensis*, and *Hygromia striolata* from Richmond, Surrey ; also a fine series of shells representing a week's collecting in Staffordshire.

By Mr. J. W. Jackson : *Planorbis dilatatus*, *Pl. fontanus*, *Physa heterostropha*, and *Sphærium lacustre* obtained recently in the River Tame at Dukinfield, Cheshire.

By the Rev. Dr. A. H. Cooke : Series of *Neptunea antiqua* L. and *N. despecta* L.

By Mr. R. Harrison : Specimens of *Vitrea* and *Clausilia*.

By Dr. J. Cosmo Melvill : A curiously distorted specimen o. *Conus arenatus* Brug.

By Mr. B. Bryan : Land and freshwater mollusca collected while on service in France.

By Mr. J. R. le B. Tomlin : *Buckleya martinezi* Hid. ; *Thais gigantea* Rve. : *Marginella mirabilis* H. Ad. (type) ; *M. bellii* Sow. ; *M. bernardii* Larg. : *M. robusta* Sow. : *M. lilacina* Sow. ; *M.* (*Extra*) *extra* Jouss. ; *Acicula* (*Acme*), fifteen species : *Cypræa ingloria* Crs. (type) ; *C. kiiensis* Rob. ; *C. guttata* Gray ; *C. gaskoinii* Rve. (Gaskoin's original specimen) ; *C. mappa* var. *montrouzieri* Dautz. : *C. caput-draconis* Melv. (type) ; *C. crossei* Marie (type) ; *Cecina manchurica* A. Ad.

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CENSUS AUTHENTICATIONS.

By the late W. D. ROEBUCK, M.Sc., F.L.S.

8 **Wiltshire South.**—*Planorbis fontanus*, Potterne, one, 11th October, 1917. *Pisidium milium*, canal at Devizes, single valve, 10th October, 1917; *Agriolimax lævis*, Horton near Devizes, 10th October, 1917, two (Charles Oldham).

31 **Hunts.**—*Hyalinia radiatula*, Monk's Wood, Wood Walton, 4th September, 1918 (Charles Oldham). *Limax arborum*, *Arion intermedius* var. *grisea*, *A. subfuscus* var. *rufo-fusca*, and *fuliginea*, *Hyalinia alliaria*, *H. fulva*, *Clausilia laminata*, all from Brampton Wood, 5th September, 1918 (Charles Oldham). *Punctum pygmæum* and *Unio pictorum*, both Alwalton, 1913; *Pisidium fontinale*, Holme, 1913; *Cæcilioides acicula*, Orton Waterville, 1913 (Rev. C. E. Y. Kendall).

32 **Northamptonshire.**—*Agriolimax lævis*, Oundle, 25th February, 1918, several (Rev. C. E. Y. Kendall).

33 **Gloucester East.**—The Moreton Valence record for *Paludestrina jenkinsi* is for this vice-county, not 34 Gloucester West, as before recorded (Chas. Upton).

40 **Shropshire.**—*Limax arborum*, *Milax sowerbyi*, *Arion intermedius* with var. *grisea*, Church Stretton, 16th September, 1918 (G. B. C. Leman).

43 **Radnorshire.**—*Vertigo pygmæa*, Cwmbach, Glasbury, two (J. Williams Vaughan, 5th September, 1917).

48 **Merionethshire.**—*Succinea elegans*, Barmouth Junction, one, 28th June, 1917 (Charles Oldham).

49 **Carnarvonshire.**—*Helix hortensis*, Aberdaron, August, 1917 (Rev. Edward Peake).

50 **Denbighshire with Llandudno.**—*Limax flavus*, *L. cinereo-niger*, *Arion subfuscus*, *A. circumscriptus*, and *Hyalinia lucida*, all from Old Colwyn, 24th June, 1917 (Charles Oldham).

56 **Nottinghamshire.**—*Hygromia striolata* (*rufescens*), Worksop, 27th May, 1917, Newark, 2nd June, 1917. This fills up what was hitherto the inexplicable blank in the Census of so well-worked a county. *Testacella haliotidea*, Southwell, 26th September, 1918, three (Prof. J. W. Carr).

59 **Lancashire South.**—At last we have been able to authenticate *Milax sowerbyi*, a fine adult, taken 9th October, 1916, in his garden at 1, Condray Road, Southport, by Capt. W. J. Farrer.

69 **Westmorland-with-Lake-Lancashire.**—*Planorbis spirorbis* var. *leucostoma*, Lower Allithwaite, August, 1907, one (Geo. H. Taylor).

70 **Cumberland.**—*Paludestrina jenkinsi*, St. Bees, numerous, September, 1916 (George Shrubsole).

77 **Lanarkshire.**—*Limax maximus* var. *cellaria*, Conder Water Glen, Larkhall, 1st June, 1918 (Wm. Rennie).

86 **Stirlingshire.**—*Milax gagates* var. *rava*, garden, Griffiths Street, Falkir 26th September, 1917. *Hyalinia lucida*, bank of Union Canal, near Falkir 26th October, 1917, one; *Limnæa glabra*, several, in roadside pool, Dru Road, Falkirk, October, 1917; *Zonitoides nitidus*, garden, Arnothill, Falkir 10th January, 1918 (Geo. Nelson).

88 **Perthshire Mid.**—*Paludestrina jenkinsi*; Tay river, near Elcho, on stone Wm. Barclay, August, 1906 (Perth Museum). *Testacella scutulum*, Dumbarne House, near Bridge of Earn, 26th April, 1917 (Henry Coates).

94 **Banffshire.**—*Acanthinula aculeata*, Cullen, a few, 10th September, 19 (Miss J. Gowan).

105 **Ross West.**—A printer's error has to be corrected in record of *Pisidiu* species at Gairloch (see *Journ. of Conch.*, 1915, vol. xiv., p. 312), wherein *P. nitidum* is mentioned instead of *P. milium* from Gairloch. The record in the books is of *P. milium*, and the Hon. Recorder is grateful to Dr. James Ritchie for pointing out this misprint (*Scottish Naturalist*, October, 1915, p. 310).

109 **Caithness.**—*Arion subfuscus* var. *fuliginea* and *A. circumscriptus*, Canisbay near Wick, 22nd August, 1918 (Miss K. Duffus).

125 **Co. Kildare.**—*Helicella heripensis*, Curragh camp ground, three miles north of Kildare, 14th March, 1918, two (Lance-Corporal Ernest Stainton, 2/1st Fife and Forfar Yeomanry).

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"Ground" Clausilias.—Of our British Clausilias only one (*rolphii* Gray) can, I think, be regarded as a normally "ground" species. Its favourite habitat appears to be at the foot of the stalks of the common nettle, and if it ascends trees, it only does so quite exceptionally. Our other species of Clausilia may be said to prefer a situation off the ground—rocks, trees, walls, etc., though, no doubt, cases, e.g., *laminata* Mont., occur when they are found actually on terra firma. It may be interesting to record that in August, 1912, I came across a remarkable colony of "ground" Clausilias. Not all of the species are regular ground haunters; one at least (*orthostoma* Menke) is much more commonly found on smooth-barked trees, while *cana* Held is almost ubiquitous in its choice of habitat. The locality was a steep mountain side, facing north, above Busteni, in West Roumania, the height perhaps 4,000 feet, the ground a patch of nettles and other low-growing herbs in the middle of a smooth grassy clearing, about half-an-acre square, surrounded by pines above and below. No place would have looked more unlikely for mollusca, which detest pinewoods, and no Clausilia will ever ascend a pine if it can possibly help it. Yet in this patch, perhaps two yards square, something suggested a search, and in three-quarters-of-an-hour I obtained eighty-nine specimens and eight species of Clausilia (other genera are omitted) namely:—*cana* Held (Alinda) 6; *dubia* Drap. (Iphigenia) 11; *elata* Zieg. (Uncinaria) 16; *fallax* Rossm. (Alinda) 38; *filograna* Zieg. (Graciliaria) 8; *latestriata* Bielz (Pirostoma) 7; *orthostoma* Menke (Clausiliastra) 1; *plicata* Drap. (Alinda) 2. All were living specimens. *Cl. fallax* I have often found in similar situations, once near the Roterthurm Pass, in South Hungary, in very hot weather, a couple of inches under the ground at the roots of nettles. Bielz (Fauna Siebenbürgens, 1867, p. 156) states that it occurs on old tree trunks under loose bark, more rarely on the ground beneath fallen leaves and rotten wood. I have taken it in association with *Alopia regalis* M. Bielz on a rock face at the northern foot of the Piatra Mare. *Cl. filograna* Zieg., one of the tiniest of Clausilias, is also a ground-living species, though it did not occur to me on the occasion referred to.—Rev. A. H. Cooke, Sc.D., F.Z.S. (*Read before the Society*, October 12th, 1918).

NOTE ON CONUS CHYTREUS Melvill.

By ARTHUR T. HOPWOOD.

(Read before the Society, September 10th, 1919).

PLATE II.

THE type *C. figulinus* var. *chytreus*, now in the Melvill-Tomlin Collection, was, until the discovery of the two specimens which are here described, unique, and since my two differ from it in several particulars, and caused Dr. Melvill to consider it a true species, I consider it worth while to figure them (pl. 2, f. 4–6). They may be described thus:—

Shell shaped as in the type. Ground colour dirty white; spire broadly radiated with red brown. Epidermis thin, smooth, pale olive yellow.

On comparing with *C. figulinus* Linn., we find differences in

(*a*) The character of the epidermis, which is thin, smooth, and of a pale olive yellow colour, instead of being thick, velvety, and brown.

(*b*) The shell which is stouter and not so pyriform, or so attenuate towards the base.

(*c*) The spire which is radiated and flamed and not of a uniform tint.

(*d*) The colour lines which are fewer and much thicker in proportion.

These characters seem sufficient reason for elevating *C. chytreus* to the rank of a species, and since in (*b*) and (*c*) the shell approaches *C. glaucus* Linn. its systematic place appears to be between *C. glaucus* and *C. figulinus*.

I do not consider the difference in ground colour between my specimens and the type sufficient justification for making a distinct variety; similar variations occur in *C. betulinus* Linn., *C. glaucus* Linn., and *C. figulinus* Linn., especially the last, specimens of which from the Eastern Archipelago are dark chocolate, whilst one from Bombay, in the Manchester Museum, is a dirty yellowish white.

In conclusion, I must express my indebtedness to Dr. Melvill for identifying my examples and for an opportunity of comparing them with the type; to Mr. J. W. Jackson for giving me the shells, and for furnishing me with the photographs here reproduced; and to the Manchester Museum Authorities for the use of the magnificent example of *C. glaucus*, e coll. R. D. Darbishire.

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NOTES ON KENTISH MOLLUSCA.

By H. C. HUGGINS.

(Read before the Society, September 11th, 1918).

In the past two years I have been collecting in the chalk down districts of Kent, between Sittingbourne and Maidstone, and hope the following records, some new to Kent, may prove of interest.

Limax cinereo-niger.—In June this year Mr. Greville Tempany pointed out a half-grown specimen of this species crawling on the road between Hucking and Stockbury, about five miles from Maidstone. Subsequent searching revealed the metropolis of the species, a row of very old hollow ash and hornbeam stumps, covered with fungi. In all, I saw about two dozen specimens, of which two were of the typical jet-black form, with a white keel. The remainder were nearly all of an ashy white colour, more or less spotted and banded with black, while two had the ground colour of a warm fulvous brown, and one was entirely ashy white with a single lateral dark grey band.

Limax arborum.—In April last I took three very large examples of this species of a uniform pure white colour, with the exception of a very faint grey stripe on each side of the shield, at Hollingbourne.

Limax flavus.—I took a single specimen of the var. *grisea*, deep greyish black with white spots and transparent colourless slime on the side of a pond at Hollingbourne.

Limax tenellus.—Three specimens on August 25th under a fungus-covered log in the beech woods at Hucking. This appears to be a very early date, possibly they were attracted to the surface by a heavy rain then falling.

Acanthinula lamellata.—I found a dead example of this species in the same beech wood at Hucking, which produced *L. cinereo-niger* and *L. tenellus*. The woods are of comparatively recent date, mostly of beech, ash, and false acacia, but evidently they were planted on the site of an ancient piece of forest land.

Helicella gigaxii var. **albina.**—Among a large colony of typical examples found near Hucking I picked out four examples of this scarce variety.

Helicella virgata.—At Charing I found a colony of var. *hyalozona* in company with the var. *radiata* on the hill-side. Both these forms appear to be littoral in Kent except here, and the species at Charing is also of the small maritime high-spired race.

Helicella elegans.—While collecting this mollusc near Kearsney I found a number of specimens of a form I have not seen described, in which the band, instead of being blackish, is of a pale lemon yellow colour, corresponding to the var. *ochroleuca* of *H. virgata*.

Helix hortensis.—Mr. J. W. Taylor regards this as a less dominant species than *nemoralis*, but so far as my experience goes in this district it is decidedly more dominant, *nemoralis* being scattered and comparatively scarce, whereas *hortensis* swarms in suitable localities from the top of the chalk downs to the marshes. It is also a very adaptable species, as I have found a few examples on Shorne Mead Saltings, near Gravesend, where all the ground is strongly impregnated with salt. With the exception of a few mounds all this land is submerged at the higher spring tides. All the specimens were white, very large and coarse, and usually much weathered.

Helix nemoralis.—A large colony of var. **citrinozonata** was common four years ago in a reed bed on the Cliff marshes, near Gravesend, the colour being wonderfully adapted to that of the yellow reed stems.

Limnæa auricularia.—During the past few years I have noticed in this county and also elsewhere the association between adult specimens of this species and broad leaved plants, notably waterlilies and *Potamogeton*. The full-grown "auriculated" examples in the summer usually appear to sit on the upper surface of the leaves; it is possible that the great expansion of the lip is caused by this habit, as when I have found "auriculated" specimens where waterlilies do not grow they have always been clinging to piles or wood-work. I have further noticed a tendency on the part of *pereger* to produce a widely expanded lip where *auricularia* is found, and at Cobham Park, where *auricularia* is absent but waterlilies abound, the *pereger* have the most broadly expanded lips of any I have seen. A similar phenomenon can be noticed in *Succinea pfeifferi*, when it lives on flags over water the mouth and shell are broad as in *putris*, but where it lives on mud in ditches usually almost dry, as in a large colony I recently found in Burwell Fen, the shell is very narrow and the animal appears much less muscular, doubtless from the absence of the muscular exertion required when the species clings to flags above water. It would be interesting to ascertain if water-lilies or wooden piles are found in the Irish localities where the var. *acuta* only is found, as the lip appears to be developed only in adult examples, and the younger specimens here appear to cling to weed just like *pereger*. Many young specimens here are almost indistinguishable from the var. *acuta*, which is what might be expected if the fully expanded lip and swollen body-whorl are recently acquired characteristics due to changed conditions.

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THE LAND AND FRESHWATER MOLLUSCA OF AUDRUICQ, PAS-DE-CALAIS.

BY JNO. W. TAYLOR, M.Sc.

(Read before the Society, October 13th, 1917).

LIEUT. C. Theodore Cribb, who was stationed at Audruicq, near St. Omer, during 1916, availed himself of his scanty opportunities to make a collection of the mollusks to be found within a radius of four or five miles of that place; these results being supplemented by an occasional visit to Calais.

The district around Audruicq—embracing Hénuin, Ostove, Polincove, Zutkerque, etc., all within the arrondissement of St. Omer, and included in the old and comparatively uninteresting province of Picardy—resembles Lincolnshire in being flat and monotonous and intersected with many ditches and dykes; the only wooded portion occupied the crest of a range of hills five miles away, was composed chiefly of pines, silver birch and heather, and no mollusks whatever were found therein. The total absence of loose stone walls was a deprivation of another fruitful field of investigation. There is no limestone whatever, which may account for the tenuity of many of the shells and the absence of others from the list, but renders the more remarkable the unusually thickened calcareous apertures of some of the freshwater species.

There were no small streams, and the river-bed was purely sandy and very unstable, but furnished no mollusks.

In 1838 Bouchard-Chantereaux published an excellent treatise upon the mollusks of the Pas-de-Calais, the only one ever published for this department, in which he enumerated 102 species, but after deducting those species which are halophilous and others which are now regarded as varieties, this number may be reduced to 85.

Lieut. Cribb found 55 species, which must be regarded as a gratifying result, more especially as six species are additional to those cited by Bouchard-Chantereaux.

Twenty-four species of land shells were found, two of which are additions to Bouchard-Chantereaux's Catalogue.

Arion ater (L.).—The type form of this species was rare about Audruicq, but the fuscous form, var. *brunnea* Roebuck is widely distributed and common.

Bouchard-Chantereaux cites *Arion ater* and nine varieties. He also enumerates *Arion hortensis* and *Arion flavus=Arion intermedius.*

Limax maximus L.—Several shells of this species are in the collection from animals found at Polincove in July. The shells all have well marked growth lines and clearly show that *L. maximus* is derived from an ancestor with a spirally coiled dextral shell.

It may be well to remark that every slug in its embryonal stage possesses a spirally coiled shell, the Arions being no exception to this rule. In some genera the embryonal shell is even said to be furnished with an operculum.

Bouchard-Chantereaux describes *L. maximus* as common in the department and cites four varieties, he also catalogues *L. agrestis*, *L. brunneus*, *L. arborum* and *L. variegatus*.

Vitrina pellucida (Müll.).—Is only represented by a few small and mostly dead shells from Hénuin, though Mr. Cribb describes the species as very common and well distributed.

Bouchard-Chantereaux says "common throughout the department."

Hyalinia cellaria (Müll.).—Specimens collected at Audruicq in June and at Ostove in November are remarkable for their unusually brilliant polish, quite reminiscent of *helvetica*. Bouchard-Chantereaux enumerates this as *Helix nitida* Drap., and probably includes under this name *Hyalinia lucida* also.

Hyalinia nitidula (Drap.).—The examples found at Polincove and Ostove in November are richly coloured and large, so large indeed as almost to entitle them to be var. *major*. Bouchard-Chantereaux does not include this species, but may possibly have confused it with his *Helix nitida* or *Helix lucida*.

Hyalinia pura (Alder).—Collected at Polincove in November; apparently referable to var. *lenticula* Held. This is at present only known in England from Watlington, Oxon., and the species was unknown to Bouchard-Chantereaux.

Hyalinia crystallina (Müll.).—Two found at Polincove in October. One specimen is referable to the var. *contracta* Clessin. Catalogued by Bouchard-Chantereaux.

Zonitoides nitidus (Müll.).—Found during November at Polincove; brilliantly lustrous, especially in the immature stage. Bouchard-Chantereaux catalogues this as *Helix lucida* Drap.

Pyramidula rotundata (Müll.).—Widely distributed and very common. The shells collected at Polincove in November are remarkable for their subuniform dusky pigmentation, var. *obscurata* Dumont and Mortillet, while those from Audruicq are pale rufous fawn, beautifully and distinctly maculate with rich rufous, var. *vulgaris* Dumont and Mortillet. Pas-de-Calais (Bouchard-Chantereaux).

Helix aspersa L.—Widely distributed and very common. Two specimens are from the banks of the lagoon, Calais, one a pretty specimen of var. *fasciata* Picard showing the formula 12345, the other more typical with a band formula (123)45, but also showing a strong tendency to var. *albofasciata* Jeffreys. The shells from Polincove collected in July include a fine shell showing the transverse markings of var. *undulata* overlaid on the typical formula 1(23)45. This form though less distinctly marked was the predominant feature of the collection. The var. *clathrata* was represented by a beautiful darkly pigmented shell. A curiously injured shell was evidently broken and repaired after maturity, as is shown by the repaired portions being quite destitute of epidermis and markings, due to the cessation of the secretory activity of the collar of the mantle. Bouchard-Chantereaux notes *H. aspersa* as very common and cites two monstrosities, *scalaris* and *semiscalaris*.

Helix nemoralis L.—Fairly well distributed, the specimens being gathered from three different, though probably neighbouring, localities, viz., Zutkerque, Polincove and Ostove, though the shells in the collection are mostly from Polincove, all in the arrondissement of St Omer. The var. *major* Pascal is represented by a fine shell, whose rich yellow ground colour and band formula 1:345 places it under the var. *adansonia* Moq. The var. *libellula* Risso is the most abundant colour variation in the collection, two-thirds belonging to the rich yellow var. *flava* Picard, and the remaining third to the pale yellow form, var. *lutescens* Picard. The sub-var. *aurantia-libellula* is represented by three specimens; they are of a unicolorous yellow with orange apical whorls. The var. *rubella* Picard is represented by eighteen specimens, which is a larger proportion than is usually found in this country, although only four are strictly typical of the variety. Several of the shells are of a rich deep red colour and are the var. *rubra* Baudon, others of a delicate rosy-red are referable to the sub-var. *rosea* Baudon. Of the sub-var. *carnea* Baudon. which has a flesh-coloured ground, only half-a-dozen specimens are included, but some of these would probably be more precisely indicated by Prof. Boycott's name var. *mista*. The var. *castanea* Picard is present in the form of the sub-var. *fulvo-tincta* of Ckll., of a very pale fulvous or pinkish-yellow colour, which also shows a very pale semi-transparent peripheral band and by this zonulation belongs the mutation *duchampia* Locard. Of the var. *olivacea* Risso only a single shell is present, clearly displaying the orange yellow sub-marginal band which externally borders the aperture and contrasts so strikingly with the deep, dark colouring of the rest of the shell. The var. *fascialba* Picard shows an unusualiy large proportion. It is an ancient or palæogenic form, which has preserved the calcified white peripheral zone, whose position indicates the division between the upper and lower group of bands of a former band arrangement, approximating to that now possessed by *Campylæa*. It is in this species an atavic development and therefore more frequently present towards the limits of the natural range of the species. A very handsome but scarcely mature specimen of mut. *donovania* Moq. (formula 00:45) which Mr. Cribb was rearing to maturity, is preserved by him as an interesting relic of the wrecking of his quarters by an enemy bomb, the animal being killed and shell damaged by the explosion. The var. *fasciata* Moq. is present in quite a number of mutations. The mut. *quinquefasciata* Shepp. (formula 12345) is represented by several shells with the red or the yellow ground colour. This form was regarded by its author as a species and as quite distinct from the one-banded form.

The mut. *woodia* Moq. formula 1(23)45 is an uncommon banding in this country and abroad. This formula is only recorded from the continent in the yellow variety *libellula*; in Mr. Cribb's specimen the markings are developed on a flesh coloured shell. The mut. *poiretia* Moq., formula (12)3(45), is a somewhat common form, but the shells found by Mr. Cribb are flesh coloured—the strictly typical shell has a yellow ground; the mut. *blainvillea* Moq, formula ⁝2345 differs only from *quinquefasciata* by the feeble development of the uppermost band; the mut. *adansonia* Moq., formula 1⁝345, is characterized by its ill-defined second band, and is represented by shells with flesh-coloured and also with yellow ground; the formula 00340 is one of the commonest two-banded forms, and may be referred to the mut. *brotia* Locard, although the fourth band is only weakly developed, whereas in typical forms of the mutation both bands are equally developed and deeply pigmented; the formula 00300 is well represented and is known by the French as mut. *cuvieria* Moq. when the ground colour of the shell is yellow and as mut. *guettardia* Moq. when the ground colour is red, though Moquin-Tandon by some oversight also applied the name *gærtneria* to the same form; a subsidiary mutation has the peripheral band duplicated as 003_300. Bouchard-Chantereaux lists twenty-five varieties of this species, mostly band formulæ.

Helix hortensis Müll.—There are twenty-six specimens of this species, all gathered about Zutkerque. They are very varied in character and probably the shells of this and the preceding species are selected from a much larger number; sub-var. *tenuis* Baudon, very pellucid, thin and of an unicolorous yellowish tinge; var. *sauveuri* Colbeau, described as a distinct species, and characterized more especially by the white rib inside the aperture, the violaceous-brown lip and the pale brownish stain on the penultimate whorl; usually reddish and bandless. In its lip characters it corresponds with the var. *bimarginata* of *Helix nemoralis*; var. *lutea* Picard, the bulk are referable to this variety, although only two shells possess the white lip and rib, but all present in a more or less striking way an orange-coloured apex. This modification if thought desirable may be distinguished as var. *aurantia-lutea*; it corresponds to the var. *aurantia-libellula* of *Helix nemoralis*; var. *colorata* Dum. and Mort.

is of a rosy colour, tinged with fawn, the lip is dark in colour and the rib pale, while the aperture is externally margined by a transverse yellowish band, exactly as in the var. *olivacea* of *H. nemoralis*; var. *lilacina* Taylor.—This pretty form is represented by three specimens, all of which show a tendency to approach the var. *olivacea* in colouring. They also show the purplish lip which is a characteristic feature of *hybrida* Poiret. As is usual in this variety the specimens are quite bandless; var. *rufozonata* Ckll. is exemplified by one specimen in which the bands are of a pale red-brown colour with the formula 10345; it also possesses the rose-coloured lip of the var. *roseolabiata* Taylor; var. *rufolabris* Kregl., in which the lip and internal rib are of a rich brown colour, is represented by several specimens; var. *fasciata* Moq. by eleven diversely banded shells; var. *moulinsia* Moq., formula 10305, a widely distributed variety forming more than half the total number; the common mut. *barnesia* Moq., formula 10345, is also represented; as is also the mut. *moreletia* Moq. (= mut. *bellardia* Loc.) formula 1 ⋮ 345; the mut. 1(234)5 is rather rare and has not yet been recorded for France; the var. *septemfasciata* Picard is represented by a single shell which shows the five normal and two auxiliary bands (formula $1_{2}3_{3}{}_{4}45$).

Bouchard-Chantereaux records this species as common but local in the department, and cites twenty-eight varieties (mostly of banding) and a monstrosity.

Hygromia striolata (C. Pfr.).—Locally common, but the specimens are chiefly from Polincove, many being very flat above and good examples of the var. *depressa* Taylor; some large specimens verging on 15 mm. in diameter are var. *major* Taylor. Among the smaller shells, the var. *rubens* Moq. was represented by a richly coloured specimen with a strongly developed apertural rib; while a few fairly large individuals exemplified the var. *albocincta* Ckll. As in *H. nemoralis* and *H. hortensis* this pale peripheral zone is the last vestige of a former scheme of pigmentation. Bouchard-Chantereaux cites this species as *H. rufescens*, with four varieties.

Hygromia hispida (L.).—Widely distributed and very common. The shells collected round Polincove are mainly the flat spired and widely umbilicated form described by Jeffreys as *Helix concinna*, but which is really the typical *H. hispida* of Linné. There are no really hispid specimens, and several are quite smooth and polished, the var. *depilata* Alder; var. *fusca* Moq. is also present and recognizable by the clear brown colour; this form was found at Audruicq and Polincove; its character would be well conveyed by the name *depilata-fusca*; the var. *albida* Jeffr. is represented by a somewhat small, conical and depilate shell from Polincove in which the transverse striæ are beautifully close and very finely and distinctly incised; the atavic var. *albocincta* Taylor is exemplified by several clearly banded shells; they are all of the widely umbilicate and depressed form. All the specimens show that they have inhabited an exposed or open area, being destitute of the periostracal hairs which are an almost invariable feature of individuals frequenting a moist, umbrageous environment. Bouchard-Chantereaux catalogues this species.

Theba cantiana (Mont.).—Common, but local. The specimens were collected in September by the lagoon, Calais; all are of a deep reddish colour basally and round the aperture, showing distinctly thereon the white peripheral zone characteristic of the palæogenic var. *albocincta* Ckll. Bouchard-Chantereaux notices this as common in places, under the name of *Helix carthusiana* Draparnaud. He describes the shell as usually of a whitish colour and mentions a variety which is reddish about the mouth, but does not allude to the peripheral zonulation.

Xerophila virgata (Da Costa) is represented by a few immature shells, found by the lagoon, Calais, in August; they do not exhibit any marked deviation from the ordinary form. Bouchard-Chantereaux cites this species as very common on the downs and enumerates eight varieties, and catalogues *Helix pomatia*, *H. arbustorum*. *H. carthusianella*, *H. olivieri*, *H. revelata* [= *H. fusca* Montagu], *H. pulchella*, *H. ericetorum*, *H. intersecta* and *H. striata*, the two last named are apparently equivalent to our *Xerophila caperata* and *X. heripensis*, while *Bulimus acutus* is mentioned as found dead in the alluvium of Wimereux, near Boulogne.

Ena obscura (Drap.).—Found at Polincove in May. Bouchard-Chantereaux alludes to this as rather common.

Pupa cylindracea (Da Costa).—Common, but local, and the sole representative of the *Pupillidæ* in the collection; the specimens are from the vicinity of the lagoon, Calais, where it is locally common. They are mostly the small slender form named var. *gracilis* by Issel; the exceptionally massive lip of some of the mature shells is worthy of note and such examples would be suitably named var. *crassilabris*. Bouchard-Chantereaux mentions the species as very common. He also enumerates *Pupa marginata*, *Pupa secale*, *Pupa frumentum*, *P. tridentalis* and *Vertigo antivertigo*.

Balea perversa (L.).—Found near Audruicq in June, and remarkable for rich black-brown colouring simulating the aspect of the *Clausiliæ* in the same box. All are referable to the var. *simplex* Moq., having a quadrate aperture which is quite destitute of the parietal denticle. Bouchard-Chantereaux says it is very common.

Clausilia bidentata (Ström) represents the genus in the collection, the specimens were all gathered at Audruicq in June, in company with the *Balea*, they present no feature calling for special remark. Bouchard-Chantereaux, in addition to the present series, enumerates *Clausilia bidens* [=*C. laminata*], *C. solida*, *C. plicatula*, *C. parvula*, and *C. ventricosa*.

Zua lubrica (Müll).—Represented by var. *lubricoides* Fér., found at Audruicq in July, and later on the banks of the lagoon, Calais. Bouchard-Chantereaux, under the name of *Bulimus lubricus*, speaks of it as very common.

Succinea elegans Risso is represented from two localities. Characteristic specimens of var. *sarsii* Esm., var. *contortula* Baudon and var. *longiscata* Morelet are present in gatherings from the canal banks at Audruicq in June, and m. *scalariforme*, a very interesting, fine clean shell, was found in May by a pond at Polincove. Bouchard-Chantereaux does not appear to have found this species unless it is confused with his *Succinea amphibia*.

Succinea putris (L.).—A single specimen from the canal banks at Audruicq, representative of var. *fitzgeraldiana* Hazay. Bouchard-Chantereaux alludes to this species under the name of *S. amphibia* as very common and variable, and in addition enumerates *S. oblonga* and *S. arenaria*.

Carychium minimum Müll.—Locally common, from Polincove. It is an obese form referable to the var. *ovata* Bourguignat. Bouchard-Chantereaux records it as very common.

The Aquatic Gastropods number twenty-two species and several show a noticeable and unusual tendency to form a thick, white, calcareous margin to the apertures, which is remarkable in a district said to be totally devoid of limestone.

Segmentina lineata (Walker).—Surprisingly abundant and widely distributed, and represented from Hénuin and Polincove. Specimens gathered in November from a ditch at Hénuin are very fine, some being almost eight mm. in diameter, the var. *major* Pascal; most of these are very glossy, and show as many as four internal septa very distinctly, as well as a clear white sutural line, which is probably due to a calcareous deposit.

Shells from Polincove collected during September are smaller, with feebly developed septa and show no trace of the sutural line. Recorded by Bouchard-Chantereaux as *Planorbis nitidus* Müll. The septa are found in quite young individuals, and vary in number and development in the adult. Jeffreys was in error in stating that the septa were only present in mature shells, they exist from a very early stage and are progressively absorbed as the shell is enlarged.

Planorbis fontanus Lightfoot.—Two fine specimens, referable to var. *albida* Nelson. One so thickly covered with a ferruginous deposit that the whiteness is in great part obscured. Recorded as *Planorbis complanatus* Drap. by Bouchard-Chantereaux.

Planorbis vortex (L.).—Widely distributed and abundant; shells collected in October from a ditch at Hénuin, are very compressed, but have a well-marked basal keel; they are all much encrusted with carbonaceous matter. It also inhabits the canal at Audruicq. Bouchard-Chantereaux records it as very common.

Planorbis spirorbis (L.)—Found in the pools at Ostove, are very characteristic shells of *Planorbis leucostoma* Michaud with strongly thickened white rib round the margin of the aperture. Bouchard-Chantereaux records *Pl. leucostoma* as very common in the ditches.

Planorbis carinatus Drap.—A single shell, found during November in the canal at Audruicq, and covered by a thick incrustation, a somewhat unusual circumstance with this species. Catalogued by Bouchard-Chantereaux.

Planorbis marginatus Drap.—Widely distributed and abundant, and represented by specimens from St. Pierre, Fort St. Jean, Canal at Audruicq and Polincove. Many of the shells are a large form of var. *submarginata*, in which the keel instead of being basal is situate more towards its centre, owing chiefly to the increased basal convexity of the last whorl; these specimens all exhibit a tendency when fully grown to thicken the margins of the aperture. Bouchard-Chantereaux records this as very common.

Planorbis corneus (L.).—Ditch at Hénuin and from the Audruicq Canal. Many of the shells show a tendency to, or belong to the var. *bicolor* Colbeau, in which the underside is very pale, while the remainder of the shell is normally pigmented; var. *etruscus* Charp. represented by two specimens and characterized by the bulkiness of the whorls; the var. *ammonoceras* Westl.=var. *microstoma* Colb. which has the whorls flatter and more compressed was also present, but the bulk of the shells are not quite mature. It is catalogued by Bouchard-Chantereaux as common in the stagnant waters of Artois.

Planorbis contortus Drap.—Widely distributed and very abundant, and represented from Polincove, Ostove and the ditches at Hénuin. The shells are closely coiled and of good size, the largest being fully six mm. in diameter. Fully adult shells from the pool at Ostove are clearly var. *labiata* Westl. in which form a strong white rib encircles the aperture; specimens in which the mouth is not completed show white transverse bands at irregular intervals, indicating the presence of thickened, former apertural margins and the probability of a thickened termination to the shell mouth being formed when growth was fully completed. Bouchard-Chantereaux describes this species as very common, and also catalogues *Pl. hispidus*, *Pl. imbricatus*, *Pl. cristatus* and *Pl. compressus*.

Aplecta hypnorum (Drap.).—Gathered in July from pools at Ostove; they are pale and very glossy shells. Bouchard-Chantereaux records this as very common in flowing water.

Physa fontinalis (Drap.) is restricted in range though common where it occurs; the specimens in the collection are from Polincove and from the ditch at Hénuin, and are chiefly var. *oblonga*, with a single shell belonging to var. *inflata*. Bouchard-Chantereaux says it is common.

Physa acuta (Drap.)—Local, but common where it occurs; numerous fine specimens during November in the Audruicq canal. Apart from size and shape, a good distinguishing character is the outline of the deposit of the inner lip, which is also an index to the amount of development of the mantle-margin. This species, which is new to the department, would appear to be somewhat capricious in its development or appearance, as Mr. Cribb had several times previously closely searched the identical spot where the species abounded during November, without noticing any sign of its presence.

Velletia lacustris (Drap.) is represented by fairly fine, though much encrusted specimens collected in November from a ditch at Hénuin, but it is also present in the Audruicq Canal. Bouchard-Chantereaux catalogues the present species, and also *Ancylus fluviatilis* and remarks that the examples of this latter species found in river Wimille are of enormous size.

Limnæa stagnalis (L.).—Found in June in the Audruicq Canal; they are the ordinary form, and offer no special features. Cited as a very common species by Bouchard-Chantereaux.

Limnæa palustris (Drap.).—Rather dwarf specimens of this species, found during June in the Audruicq canal, are ashy-brown in colour, with usually a strong purple submarginal thickening inside the aperture; they are the var. *corviformis* Germain.

Limnæa peregra (Müll.).—Mr. Cribb remarks that though widely distributed, it is not by any means so abundant and variable as it is in England, and this is also apparently true for most of North Central Europe, in which region *L. auricularia* is more prevalent. Representatives collected in November from the Audruicq Canal are referable to the vars. *ovata* Drap., *microcephala* Cless. and *dickinii*=*major* Kob. The shells from St. Pierre belong to var. *ampullacea* and var. *excerptus* Hartm. Bouchard-Chantereaux cites *Limnæa peregra* and *L. ovata.*

Limnæa auricularia (L.).—The shells collected during November in the Audruicq Canal represent the typical form, but one is referable to *Limnæa acutalis* Morelet, a form which may prove to be distinct when its structure has been carefully examined. Bouchard-Chantereaux, in addition to the foregoing species, catalogues *L. glutinosa* and *L. minuta.*

Vivipara contecta (Millet).—Widely distributed and very common; the specimens found at Ostove in July are clean, olive-green shells, with three narrow, dark spiral bands; some shells show about fifteen distinct transverse ridges extending from the umbilicus to the angle of contabulation. Specimens from the ditch at Hénuin have the green ground overspread by brown. Bouchard-Chantereaux cites this species as *Paludina vivipara* Lam.

Vivipara vivipara (L.).—Specimens gathered in July from Audruicq Canal are very clean, medium sized, inclining towards the var. *pyramidata,* to which one clearly belongs. All are clear, grey-green shells, with three well-marked dark spiral bands; the operculum of this species is more distinctly pyriform than that of *contecta.* This species is catalogued by Bouchard-Chantereaux as *Paludina achatina.*

Bithynia tentaculata (L.).—Is widely dispersed and very abundant; the specimens found near Fort St. Jean belong to the var. *ventricosa* Moq., and are very clear and mainly fawn coloured. The var. *marginata* Baudon is also represented in the collection; it is characterized by the thick white marginal rib to the aperture, a feature which is also present at the termination of each periodic growth in the young. Bouchard-Chantereaux cites this as a very common species under the name of *Paludina impura* Lam.

Bithynia leachii (Shepp.).—Found at Polincove in June, also during November in a ditch at Hénuin, and the Audruicq Canal; they are very translucent and quite characteristic specimens of the var. *elongata* Jeffr. This is another species not known to Bouchard-Chantereaux, and an addition to the fauna of the department.

Valvata piscinalis (Müll.) was found during July near Fort St. Jean, and is locally common. The specimens are mostly of ordinary form, but a few show more or less distinct traces of spiral ridging recalling the American *Valvata tricarinata* Say.; this form has been named var. *arcelini* Bourguignat, and would appear to indicate a descent from some spirally ribbed extinct species, and is therefore of highest interest. Noted as very common by Bouchard-Chantereaux.

Valvata cristata (Müll.).—Widely distributed and very abundant; the specimens in the collection are from pools about Ostove, but present no unusual features. Bouchard-Chantereaux catalogues *V. spirorbis*, *V. planorbis* and *V. minuta*.

Sphærium corneum (L.).—Widely distributed and very common. Specimens gathered in November from the ditch at Hénuin are of a greyish-yellow colour, the var. *flavescens* of Macgillivray. The specimens from Ostove are remarkably globose and almost spherical, the var. *nucleus* Studer; there are also many representatives of the var. *vittata* Garnier, which is distinguished by three or four concentric zones of yellow and the darker ground colour of the shell, as well as a few of the var. *regularis* Pascal, which has a distinct yellow area around the margin of each valve. The Audruicq Canal yielded examples of the var. *cinerea*, in which the whole shell is of a cinereous or ashy-grey, and also from another part of its course some pretty examples of var. *vittata* Garnier. This species is catalogued by Bouchard-Chantereaux.

Sphærium rivicola (Leach) is locally common in the Audruicq Canal. Many of the shells are uniformly ash-grey, var. *cinerea*, but others belong the var. *limbata*, in which the margins of the valves are zoned with yellow, and there is a black concentric zone near the middle of the shell. Bouchard-Chantereaux cites *Cyclas rivalis* Drap. which Moq. includes as a var. of *S. corneum*, but Bouchard-Chantereaux probably alludes to this species.

Sphærium lacustre (Müll.)—A small and not perfectly mature shell found in July at Polincove. This is listed as *Cyclas calyculata* Drap. by Bouchard-Chantereaux.

Pisidium amnicum (Müll.) is represented by specimens of var. *nitida* Baudon, a form which is almost devoid of the well-marked concentric ridges of the type shell. They were collected in July at Polincove. This is cited as *Cyclas palustris* by Bouchard-Chantereaux.

Pisidium pusillum (Gmelin) was found in the pools of Ostove. Bouchard-Chantereaux cites *Cyclas fontinalis* Drap. which, according to Moquin-Tandon, refers in a large measure to the present species.

Pisidium henslowanum Jenyns.—Of this species there is a pale but unusually fine specimen (five mm. diameter) collected during July in the canal at Audruicq. This is another addition to the fauna of the Pas-de-Calais.

Unio pictorum (L.).—In the canal at Audruicq, and represented by an almost uniformly yellowish variety, the var. *flavescens* Moquin-Tandon and by the var. *milleti* Moq., which is characterized by its greenish-yellow colour, and the distinct and regular darker growth periods. The form of this variety is well represented, though in a smaller size, by Dr. Jeffreys in Brit. Conch. Bouchard-Chantereaux catalogues *Unio pictorum*, *U. rostrata*, *U. tumida*, *U. batava* and *U. arcuata*.

Anodonta cygnea (L.).—The collection contained two small and immature shells from the Audruicq Canal; they distinctly show the strong concentric umbonal sculpture, and I could detect no trace of the anterior and posterior muscle scars which are so distinct in the adult. The var. *ventricosa* C. Pf. is represented by an olive-green shell as is var. *piscinalis* Rossm. Bouchard-Chantereaux cites *Anodonta anatina*, *A. intermedia*, *A. cygnea* and *A. ventricosa*.

◆

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

ANNUAL REPORT.

The present is the Forty-Third Annual Report of the Society. During the past twelve months we have lost eight members by death, seven by resignation, and three names have been struck off the roll, making a total loss of eighteen. Twenty-one new members have been elected (including two at this meeting). The membership of the Society now stands at 290 (including eight honorary members), as against 287 at the last annual meeting.

The deaths that the Society has to deplore are those of the Rev. Canon A. M. Norman, a former President of the Society, and one of the chief authorities on marine invertebrata; Dr. H. R. Simroth, a former Honorary Member; Alan Owston; D. J. MacLeod; James N. Milne; S. Lister Petty; Dr. G. H. Broadbent; and W. Denison Roebuck, a past President and Honorary Member and Hon. Curator. Mr. Roebuck was also one of the founders of this Society, as well as one of its most faithful and enthusiastic adherents.

Obituary Notices of Canon Norman and of Mr. Roebuck have already appeared in the *Journal of Conchology*, and wherever possible the Council has sent letters of condolence to the relatives of the deceased members. The two vacancies in the list of Honorary Members have not yet been filled.

The usual monthly meetings have been held at the Manchester Museum, and the attendances have been well maintained. About twenty notes and papers have been read before the Society, some of which have already been published in the pages of the *Journal*. In addition to numerous smaller Exhibits, the following Special Exhibits have been held:—*Pleurodonte* (sensu stricto), *Tellina*, British *Purpura*, British *Littorina*, British *Ena* and *Balea*, *Obeliscus*, *Stilifer*, *Oleacina*, and *Streptaxis*.

As foreshadowed in the last Annual Report the Council has been compelled further to curtail the issue of the *Journal*, as it was not found possible to publish more than two numbers this year. This curtailment is to be regretted, but the rise in the cost of production rendered it absolutely necessary; otherwise the Society would have been faced with a severe financial crisis. Further measures of economy in the issue of the *Journal* would be detrimental to the interests of the Society and to Conchology in general, and in order to maintain even the present curtailed issue it will be necessary to have a considerable increase in revenue. After due consideration the Council has decided that the only means of bringing this about is to increase the annual subscription from 5/- to 10/- for new members, and to appeal earnestly to present members voluntarily to increase their subscription. In like manner it is proposed to increase the Life Composition Fee from Three Guineas to Six Guineas for future Life Members, and to appeal for increased support from present Life Members. The resolution embodying these proposals was duly advertised and submitted to the members of the Society at a Special Meeting held immediately prior to the present meeting and was carried *nem. con.* The Council feels confident that sufficient support will be forthcoming to enable the useful work to be carried on, and to maintain the high status of the *Journal.*

The Council wishes particularly to point out that authors must be prepared to pay the printers' charges for any alterations made in their proofs. In the case of Reprints, the Council has decided to have them issued in a cheaper form and without covers, and authors having illustrations to their papers are invited to contribute towards the cost of printing plates, in addition to paying for the blocks.

The Library has been fairly well used, and during the past twelve months has received a number of additions, the chief donors being the late Mr. W. Denison Roebuck, Drs. A. E. Boycott, H. A. Pilsbry, P. Bartsch, W. H. Dall, Lieut.-Col. H. H. Godwin-Austen, Messrs. H. Mückardt, A. T. Hopwood, Chr. Petersen, J. A. Grieg, H. O. N. Shaw, J. R. le B. Tomlin, and J. Wilfrid Jackson. In order to economise space in the *Journal* it has been decided not to publish the various additions in the Proceedings, at least for the present.

The Autograph Collection has been considerably augmented by a large batch of autograph letters presented by Mr. Hans Schlesch. Other additions were duly noted in the Proceedings of November 13th, 1918.

The Donations to the Cabinet have been very few, and consist mainly of voucher specimens from the Hon. Recorder. An exceedingly fine collection of slides of Molluscan Radulæ, prepared by the late Rev. Prof. H. M. Gwatkin, has also been recently presented by Mr. Joseph Bliss. This addition is very welcome, as the Society did not possess any radulæ for purposes of study. The best thanks of the Society have been sent to Mr. Bliss.

RECORDER'S REPORT.

COMPARATIVELY few fresh records have been added to the Census during the past year. Mr. Roebuck's death in February naturally upset the ordered progress of his organisation, and it is only during the autumn that it has been possible to announce the reduction of the sixty thousand entries which he left in the record books. It is proposed to complete and publish a new edition of the census as quickly as possible, as a memorial to the originator and chief executant of the scheme.

ANNUAL REPORT OF THE LEEDS BRANCH.

ELEVEN meetings have been held, five in the field and six indoors. Four papers have been given. In October last Mr. J. A. Hargreaves gave a paper on "The Origin of the British Marine Mollusca," and in February a second paper on "The Origin of the Freshwater Mollusca." He showed how, by transitionary stages, the evolution from marine to freshwater forms had come about.

In November Mr. F. Rhodes gave a paper on "Evolution in Mollusca." He confined his remarks to the lower forms, and showed the great similarity in the early stages of development in certain mollusca, the Brachiopoda, and worms.

In March, Mr. J. W. Taylor gave a paper on *Xerophila virgata*, the species which is next in order for the coming part of his Monograph.

Our membership at the present time is twenty-seven, with two corresponding members. Mr. H. L. Stephenson is our President.

The Branch has to mourn the loss by death of Mr. W. Denison Roebuck, M.Sc., F.L.S., one of its ablest members and one of the Founders of the Parent Society.

F. BOOTH, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

EIGHT meetings of this Branch have been held during the past year.

The exhibits, as usual, were varied and interesting. A very fine series of *Helix aspersa* is worth mentioning.

Mr. A. S. Kennard continued his useful notes on British Non-Marines.

The attendance was below the average, and partly for this reason, partly on account of high railway fares the usual field-meetings were dropped.

Once more we have to thank Mr. J. C. Dacie for allowing us to use his office for our meetings.

J. E. COOPER, *Hon. Sec.*

ANNUAL REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

THIS Branch has been in a suspended state of animation during the past year, mainly owing to the absence on foreign service of the Secretary. As the Secretary is now demobilised, and a few more in this district have taken up the study of conchology, we are looking forward with great hopes to next session.

B. BRYAN, *Hon. Sec.*

486th Meeting, held at the Manchester Museum, November 12th, 1919.

Mr. R. Standen in the chair.

New Member Elected.

Arthur K. Lawson.

Resignation.

Mrs. Agnes F. Kenyon.

Member Deceased.

Thomas Hey.

Paper Read.

"Two Molluscan Associations in North-east Staffordshire: 1.—*H. nemoralis* Linné and *H. hortensis* Müller; 2.—*Balea perversa* (L.) and *Clausilia bidentata* (Ström)," by W. E. Alkins, M.Sc.

Principal Exhibits.

By Mr. W. E. Alkins:—A large series of *Helix nemoralis*, *H. hortensis*, *Balea perversa*, *Clausilia bidentata*, and other associated species to illustrate his paper. *Limnæa glabra* from six new stations near the limestone, Three Lows, N. Staffordshire (altitude 1,100 feet). *Sphærium lacustre*, very small thin form associated with *Limnæa glabra*, and a large robust form from a neighbouring pond, near Three Lows. *H. fusca* (alive and cleaned) from North Wood, Ramsor. *A. aculeata*, *P. rotundata* var. *alba*, *L. palustris*, etc., from Oakamoor district. *Vertigo substriata*, Star Wood, Oakamoor, and *H. caperata*, Waterhouses—in each case the second record for Staffordshire.

By Mr. W. Cartwright :—Specimens illustrating variation in *Helix arbustorum*, from Buxton, etc.

By Mr. W. H. Davies :—Photographs of Lymm Dam, Cheshire, showing banks of *Anodonta* left high and dry. *H. nemoralis*, extremely small forms, from Deep Dale, near Buxton ; *H. nemoralis*, large forms, from Baguley.

By Mr. G. C. Spence :—Large series of *Urocoptis*.

By Mr. A. J. E. Cave :—*Strombus canarium* L., var. *vanikorensis* Quoy with operculum.

By Mrs. Blundell :—*Gibbus martensi* E. A. Smith, from Fernando Po.

By Mr. J. H. Matthews :—Large *Planorbis corneus* and *L.. stagnalis* from Sale Meadows.

In the Special Exhibit, *Physa*, series were shown by Messrs. J. W. Jackson, R. Standen, C. H. Moore, W. H. Davies, J. Ray Hardy, Mrs. Gill, and the Manchester Museum.

487th Meeting, held at the Manchester Museum, December 10th, 1919.

Mr. R. Standen in the chair.

Candidates Proposed for Membership.

William Robert Eastwood, Curator, Municipal Museum, Oak Hill Park, Accrington (introduced by J. W. Jackson and G. C. Spence).

Arthur Wadams Ward, 12, Britannia Square, Worcester (introduced by R. Standen and J. W. Jackson).

Resignations.

P. H. Grierson. J. W. Whitwell. Rev. H. A. Soames. Mrs. J. Linton.

Papers Read.

"The South Devon Race of *Hygromia limbata* (Drap.)," by H. C. Huggins.

"Four New Marine Shells from South Africa," by J. R. le B. Tomlin.

"Giant Race of *Cardium edule* L.," by R. Winckworth.

Principal Exhibits.

By Mr. A. T. Hopwood :—*Conus archithalassus* from Seychelles and *C. magus*.

By Mr. A. K. Lawson :—*Limnæa stagnalis* and *Planorbis campanulatus* from Wabamun Lake, Alberta, Canada.

By Mr. G. C. Spence :—*Ramsdenia mirifica* Preston, from Bayate, Guantanamo, Cuba.

By Mr. J. Wilfrid Jackson :—Shells from the raised beach at Kallow Point, Port St. Mary, Isle of Man, including *Littorina littorea*, *L. obtusata*, *Calliostoma zizyphinum*, *Gibbula cineraria*. *Ocinebra erinacea*, *Patella vulgata*, *Helcion pellucidum*, and *Purpura lapillus* (small, thick form, like fig. 6 in plate Camb. Nat. Hist., "Molluscs").

By Mr. R. Winckworth :—Exceedingly large *Cardium edule* from Congesquoy, near Stromness, Orkneys, to illustrate his note.

In the Special Exhibit, British *Cardium*, series were shown by several of the members.

It was decided to have the following Special Exhibits :—

January 14th	- - -	*Helix pisana*.
February 11th	- - -	*Ampelita*.
March 10th	- - -	Abnormal Shells.

488th Meeting, held at the Manchester Museum, January 14th, 1920.
Mr. R. Standen in the chair.

Donation to Portrait Collection announced and thanks voted :
Portrait of Lovell Reeve, from Dr. J. C. Melvill.

New Members Elected.

William Robert Eastwood. Arthur Wadams Ward.

Candidate Proposed for Membership.

Miss Mary Dixon, Broadwater, Pine Road, Didsbury, Manchester (introduced by J. H. Matthews and A. T. Hopwood).

Member Deceased.

M. M. Schepman.

Paper Read.

"Notes on the Non-Marine Mollusca of Mortehoe, No. 4," by Mrs. M. Jane Longstaff.

Principal Exhibits.

By Mr. A. T. Hopwood : *Conorbis coromandelicus* Smith from the Gulf of Oman.

By Mr. W. H. Heathcote : Mounts of small shells, with enlarged figures, prepared for the Kendal Museum.

By Mr. W. E. Alkins : *H. fusca*, taken in Star Wood, Oakamoor, Staffs., December 24, 1919 (originally found here by Garner in 1844).

In the Special Exhibit, *H. pisana*, series were shown by several members, Mr. E. Collier showing an interesting group of varieties from Mogador, and Mr. R. Standen a reversed example from the Balearic Isles.

ACCOUNTS FOR YEAR ENDED DEC. 31st, 1919.

INCOME AND EXPENDITURE ACCOUNT.

INCOME.				£	s.	d.
To Balance from Account for 1918				7	9	4
,, Annual Subscriptions :						
For 1919—						
217 at 5/0	54	5	0			
1 at 10/0	0	10	0			
	54	15	0			
,, Arrears	9	15	0			
				64	10	0
,, Sale of Publications ...				4	17	7
,, Donations towards Cost of Illustrations				2	10	0
,, Advertisements				1	10	6
,, Balance, being excess of Expenditure over Income				16	16	0
				£97	13	5

EXPENDITURE.				£	s.	d.
By Publishing and Distributing *Journal of Conchology* :						
Vol. xvi., pt. 1	33	4	4			
,, pt. 2	35	19	5			
				69	3	9
,, Authors' Reprints... ...				9	9	10
,, Printing and Stationery ...				7	18	0
,, Fire Insurance				0	10	0
,, Subscriptions :						
Malacological Soc.	1	1	0			
Lancs. and Ches. Fauna Comm.	0	5	0			
				1	6	0
,, Officers' Expenses :						
Secretary ...	6	8	0			
Treasurer ...	2	0	3			
Editor ...	0	12	8			
Recorder ...	0	4	11			
				9	5	10
				£97	13	5

BALANCE SHEET.

LIABILITIES.		£ s. d.	*ASSETS.*		£ s. d.
Annual Subscriptions paid in advance :			Annual Subscriptions for 1919 :		
1920, 13 at 5/0	3 5 0		Outstanding 21 at 5/0	5 5 0	
1 at 7/6	0 7 6		Estimated to produce ...		3 3 0
11 at 10/0	5 10 0		4% Funding Loan, 94 15 4 cost		75 0 0
	9 2 6		Cash at Bankers		14 5 4
1921, 4 at 5/0	1 0 0		Balance, being excess of Liabilities over Assets ...		13 13 0
1922, 1 at 5/0	0 5 0				
1923, 1 at 5/0	0 5 0				
		10 12 6			
Due to Treasurer		10 0 0			
Life Membership Fund ...		85 8 10			
		£106 1 4			£106 1 4

LIFE MEMBERSHIP FUND.

	£ s. d.		£ s. d.
To amount of Fund on Jan. 1st, 1919	45 18 9	By Commission on purchase of Stock	0 0 9
,, Seven Composition Fees at £3 3 0	22 1 0	Amount of Fund on December 31st, 1919...	85 8 10
,, Donations by Life Members	14 12 0		
,, Dividends and Interest ...	2 17 10		
	£85 9 7		£85 9 7

NOTE.—Assets in addition to those set out in the Balance Sheet are :—(*a*), Library; (*b*), Cabinets and Collections; (*c*), Stock of Unsold Publications; (*d*), Annual Subscriptions in arrear prior to January 1st, 1919.

CHAS. OLDHAM, *Hon. Treasurer*,
Dec. 31st, 1919.

Audited and found correct,
C. H. MOORE,
E. RIDSDALE BROWN.
January 14th, 1920.

489th Meeting, held at the Manchester Museum, Feb. 11th, 1920.

Mr. R. Standen in the chair.

New Member Elected.

Miss Mary Dixon.

Candidates Proposed for Membership.

John William Hainsworth, M.B., Ch.B. (Vict.), Moravian House, Greengates, Bradford (introduced by Alfred Hartley and John W. Taylor).

William Mortimore Cross, 9, Church Crescent, Muswell Hill, London, N. 10 (introduced by R. Standen and G. C. Spence).

Papers Read.

"*Clausilia biplicata* Mont. in Essex," by F. B. Jennings.
"*Limnæa stagnalis* (L.) destroyed by Rats," by A. K. Lawson.
"*Vitrea* and *Pyramidula* destroyed by Ants," by A. K. Lawson.

"*Helicella virgata* (Da Costa) destroyed by Moles," by A. K. Lawson.

"On the Systematic Position of *Conus marchionatus* Hinds," by A. T. Hopwood.

"On the occurrence of *Physa gyrina* Say in Great Britain," by J. Davy Dean.

Principal Exhibits.

By Mr. R. Standen: Series of *Cypræa stolida* L., type and vars. *moniontha* Melv., *gelasima* Melv., *diauges* Melv., and *C. erythræensis* (Gray), from Aden; *Paludina hungarica*, males and females, from Budapest (ex coll. Hazay).

By Mr. A. K. Lawson: Specimens and photos to illustrate his three papers.

By Mr. A. T. Hopwood: Specimens to illustrate his paper.

By Mr. J. Davy Dean: *Physa gyrina* Say, from Cardiff; *Ph. heterostropha* Say, om Cardiff and other British localities; *Ph. gabbi* Tryon, from California, to llustrate his paper.

By Mr. G. C. Spence: Co-types of *Opeas burnupi* Conn., from Natal.

In the Special Exhibit *Ampelita*, series were shown by several members and by he Manchester Museum.

490th Meeting, held at the Manchester Museum, March 10th, 1920.

Mr. R. Standen in the chair.

New Members Elected.

John William Hainsworth. William Mortimore Cross.

Candidate Proposed for Membership.

Harold C. Winckworth, Major, R.A.M.C., 37, Upper Rock Gardens, Brighton introduced by Ronald Winckworth and Edward Collier).

Paper Read.

"*Pyramidula rotundata* var. *alba* at Brislington, Somerset N.," by D. Bacchus.

Principal Exhibits.

By Mr. A. K. Lawson: Shells from "Kitchen-Middens," at Tentsmuir, N.E. Fife.

By Mr. A. T. Hopwood: *Conus virgo* (4·4 inches) with operculum and periostracum; *Conus betulinus*, and others (ex coll. Alderson).

By Mr. W. H. Davies: Curious growths of *Helix aspersa* within the apertures of *Limnæa stagnalis*.

In the Special Exhibit of "Abnormal Shells," many interesting and curious examples were shown.

491st Meeting, held at the Manchester Museum, April 14th, 1920.

Mr. R. Standen in the chair.

New Member Elected.

Major Harold C. Winckworth.

Paper Read.

"Note on the Variation of *Clausilia itala* Martens," by W. E. Alkins.

Principal Exhibits.

By Mr. W. H. Davies: *Clausilia bidentata* var. *tumidula*, from Tarleton.

By Mr. J. Ray Hardy: Subscalariform specimen of *Planorbis albus*, from Wilmslow, Cheshire.

By Mr. A. T. Hopwood: Central American *Conus*, including a fine *Conus Proteus* Brug.

A Special Exhibit of *Achatinella* was held.

492nd Meeting, held at the Manchester Museum, May 12th, 1920.

Mr. R. Standen in the chair.

Candidate Proposed for Membership.

S. Wheatcroft, 67, Chapel Street, Chorley, Lancashire (introduced by A. K. Lawson and A. J. E. Cave).

Member Deceased.

Edward Collier.

A Vote of Condolence with Mrs. Collier and family was passed unanimously.

Papers Read.

"*Helicodonta obvoluta* (Müller) in Sussex,"
"*Loligo vulgaris* Lam. in British Waters,"
"*Helicella barbara* (L.) new to West Sussex,"
"*Nuculana buccata* (Stimpson) new to Britain,"—
all by R. Winckworth.

Principal Exhibits.

By Mr. A. K. Lawson: A sinistral *Helix aspersa* from Churchtown, Southport; *H. hortensis* and *Planorbis crista* from Timperley; decollate *Limnæa palustris* from Ashley, Cheshire.

By Mr. G. C. Spence: Shells from Socotra.

By Mr. R. Standen: Varieties and locality sets of *Cypræa onyx*.

In the Special Exhibit, "*Leptoconus*," series were shown by several members and Mr. A. T. Hopwood read notes on the recent and fossil species of the group.

493rd Meeting, held at the Manchester Museum, June 9th, 1920.

Mr. G. C. Spence in the chair.

New Member Elected.

S. Wheatcroft.

Candidates Proposed for Membership.

Frederick Sprate Bowring, Colonel, C.B., R.E., Hurstmead, Chislehurst (introduced by J. R. le B. Tomlin and R. Standen).

Ellis Crapper, 4, Gowrie Place, Dundee (introduced by A. K. Lawson and S. Wheatcroft).

Members Deceased.

F. E. Adams. H. C. Napier.

Papers Read.

"Obituary Notice: Edward Collier," by R. Standen.

"Notes on a Collection of Mollusca made in the Belgian Congo by F. Montague Dyke," by G. C. Spence.

Principal Exhibits.

By Mr. G. C. Spence: Congo mollusca to illustrate his paper; *Paryphanta busbyi* and egg.

By Mr. A. T. Hopwood: *Diplomorpha delatouri* and *layardi*; *Columbella terpsichore*, and *Dibaphus edentulus*.

By Mr. E. R. Brown: *Olivella gracilis* from California.

By Mr. W. H. Davies: Shells from canal, Monton.

By Mr. R. Standen: *Cypræa* from Seychelles and Hawaii.

EDITORIAL NOTES.

An important paper by Dr. D. Keilin has recently appeared in *Parasitology*, xi, pp. 430-455, plates 22-25. It deals first with the life-history of the dipteron, *Melinda cognata* Meigen, which the author found at Cambridge, living on the animal of *Helicella virgata*, and goes on to review all observations hitherto made of flies feeding on mollusks, either alive or dead.

The fly did not attack other snails living with *H. virgata.* The larva when full-grown pupates in the earth, and the imago emerges in fourteen days. The parasitised snails were found from June to September, and the fly probably has three generations a year, hibernating in the pupal stage. There are also some hitherto unpublished observations by M. E. Séguy, of Rambouillet, who has found the larvæ of *Musca domestica* devouring live snails.

Mr. J. D. Dean sends me a transcript of some interesting notes by Miss K. Haddon, which appeared in the *Proceedings of the Zoological Society* for 1915, relating to the preying of the glow-worm larva upon snails. This habit has been already described by Newport and others, but their accounts do not tally. Miss Haddon says :—"Newport describes the bite of the larva as causing great pain to the snails, whereas Fabre, in a popular article on the subject, says that the snail is anæsthetised by the bite. My observations were carried out with a Zeiss binocular, the larvæ being placed with some moss in a shallow glass dish, and supplied with small snails. . . . . The snail apparently is found quite by chance, and if hungry, the larva at once fastens on its prey. Bending its head down, it cuts its way into the snail, which promptly withdraws into its shell, the larva following. If left undisturbed, the larva feeds continuously, and is frequently joined by others until the snail is finished. Wishing to see more clearly the method of procedure, I supplied small slugs as food instead of snails. The larva bit the slug on the visceral hump, but the slug with a twist of its body slipped away, leaving a mass of mucus over the head of its enemy. . . . In the next attempt the attack was more fortunate, the larva striking right into the pulmonary cavity of its victim, but either the food was not to its taste or else it was not hungry, as it shortly let go, and the slug, which had previously been lethargic, glided off apparently undisturbed. These observations show that, in these cases at any rate, there was no anæsthetising. . . . Newport also observed some dark-coloured fluid which flowed from the mouth of the larva at the time of its attack, and apparently acted as a poison, for the snail was much more affected by the bite of a larva than a mechanical injury, such as the piercing of a needle."

Professor Boycott sends the following :—

Among recent papers on the physiology of mollusca we may note L. B. Arey and W. J. Crozier on the sensory responses of *Chiton* (*Journ. Exp. Zool.*, xxix (1919), no. 2 ; the reaction of *Mya arenaria* to light, by S. Hecht (*Journ. Gen. Physiol.*, i (1919) 657, 667) ; G. v. Rijnberk on the mechanism of contraction in the foot of *Helix* (*Arch. neerl. de Physiol.*, iii (1919) 539) ; M. Copeland on the importance of ciliary movement in the locomotion of *Alectrion* (*Biol. Bull.*, xxxvii (1919) no. 2) ; and a remarkable paper by H. N. Gould (*Journ. Exp. Zool.*, xxix (1919) no. 1) showing that the development of the male phase in *Crepidula* is brought about by some unstable substance given off by females living near by ; C. Dhéré (*Journ. de Physiol. et Path. gén.*, xviii (1919) 221) deals at length with hæmocyanin, the pigment of the blood, and (*ib.* 44) with helicorubin and helicofuscin, the pigments of the liver, of *H. pomatia.*

The Transactions of the Hertfordshire Natural History Society, xvii, Oct. 1919, contain another of Prof. Boycott's admirable œcological papers, entitled "The Freshwater Mollusca of the Parish of Aldenham." The problem which the author is attacking is, in his own words, "Why some snails live in certain sorts of places, and other snails in other kinds of habitats," and in this paper, as well as in "The Habitats of Freshwater Mollusca" (*Journ. of Conch.*, xv, p. 240) he lays down in masterly fashion the lines on which the problem should be approached, and sums up the complexities which involve it. The need of data is obvious, and the author especially suggests surveys of (1), particular areas; (2), particular species, e.g., *M. margaritifera*, *P. glaber*, and *P. corneus*; (3), particular kinds of habitats, e.g., canals and mountain lakes.

In this connexion we may call attention to the splendid series of monographs by F. C. Baker on the "Relation of Mollusks to Fish in Oneida Lake, New York," published by the New York State College of Forestry, at Syracuse University, in 1916, and subsequently. These form contributions towards just such a survey as is referred to above, and are copiously illustrated with tabulations and photographs. The most interesting perhaps are the subaqueous photographs, showing invertebrate life on various kinds of bottoms. The habits, associations, and pabulum of the freshwater mollusca are dealt with in the most minute detail.

Messrs. Caruana Gatto and Despott have published a very welcome Maltese local list, entitled "Materiali per una Malacofauna Marina delle Isole Maltesi." The last one of the sort was issued by Dr. A. A. Caruana in 1867. Gulia and Benoit began one in 1872, but it was never completed. Exact localities are given in every case and relative frequency.

We must deprecate the continued ascription of specific names to Chemnitz, who has absolutely no status as a binomial author. The extremely small number of *Pyramidellidæ* is noteworthy.

"Observations on Living Lamellibranchs of New England," by E. S. Morse (Proc. Boston Soc. Nat. Hist., xxxv, p. 139) includes descriptions of the following British species:—*Mytilus edulis* L., *Modiola modiolus* (L.), *Modiolaria discors* (L.), *Cyprina islandica* (L.), *Astarte sulcata* Fleming, *A. crebricostata* Fbs., *Turtonia minuta* (F.), *Petricola pholadiformis* Lam., *Solen ensis* L., *Mya arenaria* L., *Saxicava rugosa* Lam., and *Zirfæa crispata* (L.). Incidentally Prof. Morse remarks:—"In our *Margaritana margaritifera*, at least from Maine, the mantle is fringed with fimbriated papillæ, as in *Mytilus edulis*. I have searched in vain European descriptions of what was always supposed to be the same species, and no reference is made to these digitated papillæ lining the mantle."

Mr. Hedley has published another invaluable Check-List—that of the Mollusca of New South Wales (*Journ. and Proc. Roy. Soc. New South Wales*, vol. li.). Two special features which always commend themselves in Mr. Hedley's work of this kind are the up-to-date character of the nomenclature and the definite elimination of erroneous records. The latter is a piece of spade work invaluable in the interests of geographical distribution, but wearisome in the extreme to the compilers of lists.

Scarcity of live material has proved an almost insuperable barrier to the study of the radula of the *Mitridæ*, and one heartily welcomes Dr. Cooke's paper on this subject in *Proc. Zool. Soc.*, 1919, p. 405. The Gwatkin collection has furnished him with fourteen species of *Vexillum*, and thirty-seven belonging to ten other groups, into which he divides the rest of the family. With reference to the generic name *Cylindromitra*, we may note that Dall, in *United States Nat. Mus. Bull.* 90, p. 52, has named *Pterygia nucella* Bolten (= *Voluta dactylus* L.) as the type of Bolten's genus *Pterygia*, of which therefore *Cylindromitra* becomes a synonym.

Vitrea and Pyramidula Destroyed by Ants.—Whilst on a visit to Burnley during 1919, I spent some time in the woods, near the River Brun, searching for mollusca. They were very scantily represented, and were mostly found under large stones. Many of these stones cover the nests of the Red Ant, and in and around these nests were many dead shells, very few indeed being found under the stones not occupied by the ants. From this it would seem that the molluscs when seeking shelter had trespassed upon the ants' domain with fatal results.—A. K. LAWSON (*Read before the Society*, February 11th, 1920).

Loligo vulgaris Lam. in British Waters.—Mr. W. E. Hoyle in this Journal, vol. 10, p. 200, suggests that this species may occur in British waters, as well as *L. forbesi* Steenstrup. In some material I obtained recently for dissection from Plymouth Marine Biological Station, I was fortunate to find male and female examples of this species obtained in the neighbourhood of Plymouth. The distinction that one notes first, is the much darker coloration of *L. vulgaris*; on closer examination the entirely different arrangement of the suckers on the long tentacles is the best criterion; and in many minor points the species are different. —R. WINCKWORTH (*Read before the Society*, May 12th, 1920).

Occurrence of Physa gyrina Say **in Great Britain.**—The occurrence of *Physa gyrina* Say, at Cardiff, has been confirmed by Mr. Bryant Walker, of Detroit, Michigan. The shells were first found in the summer of 1918, by Master Paul W. Richards, in a small pond situated in one of the numerous flat meadows which lie to the west of Cardiff. The pond in question is fed by a natural spring, the water draining off through a connecting ditch, which is linked up with other cross ditches beyond. The whole district is on the alluvium, and is artificially drained. An allied species, *Physa heterostropha* Say, flourishes in the vicinity. *Physa gyrina* Say, which is a well-known species in North America, is larger, and and has a more elongate spire than is usual with *Physa heterostropha* Say. Further than that the surface of the shell is dull instead of glossy, except in the case of the young shell; the striation is irregular, and the surface of the shell often malleated. The animal has long filiform tentacles, and the characteristically digitate mantle. —J. DAVY DEAN (*Read before the Society*, February 11th, 1920).

THE NON-MARINE MOLLUSCA OF LLANDUDNO AND DISTRICT.

By H. BEESTON.

(Read before the Society, March 14th, 1917).

In August, 1901, I spent three weeks at Llandudno, and occupied much of my time collecting. In 1915 I again visited the district, and spent a fortnight in and around Llandudno, making some additional observations.

If these notes serve no better purpose they will at least shew that molluscan life is no exception to the law of change and variation; not only do habitats alter or disappear entirely through the onward march of civilization, but the animals increase or decrease very perceptibly; variation takes place; some varieties die out or nearly so, while others appear to increase and become almost permanent. Species recorded by one observer as abundant at one time apparently disappear altogether for years; then as suddenly re-appear in large numbers.

A great deal of the interest in the study of the fauna of a district is to try and discover why these changes occur.

Some rather curious facts were the outcome of my researches. When I first visited Llandudno (1901) seventeen years had elapsed since Mr. W. Denison Roebuck had published a List of Mollusca of Llandudno and District (*Quarterly Journ. of Conch.*, vol. iv, p. 206), which was followed two years later by a supplementary one from Mr. J. R. le B. Tomlin (*Quarterly Journ. of Conch.*, vol. v, p. 28).

Since then practically nothing has been published, so with my own notes and observations I have endeavoured to bring all the known information up-to-date. I am indebted very largely to these old lists for the compilation of my own, and I would like to say that so thoroughly was the district worked by Messrs. Roebuck and Tomlin that I have been able to add but few new species.

In the first place I will refer to local changes in the topography of Llandudno and district, which have caused either total disappearance of some species, or the decrease in others, which I noted in 1901.

Mr. Roebuck says:—"One pond in Abbey Road, close under the south-west escarpment of the Great Orme, . . . yields *Sphærium lacustre* and *Physa hypnorum* also."

One day I decided to explore this pond, but was greatly disappointed. I discovered a trim model yacht pond, surrounded by a gravel path, the sides of the pond being carefully concreted, the water weeds and snails being conspicuous by their absence.

Again, he says:—"*Helix nemoralis* in great variety of colour and markings swarms along the road-sides, in company with *H. aspersa* and *H. virgata*"; and, again:—"*H. nemoralis*, abundant by road-sides among thistles and on posts in the flat lands between Llandudno and Gloddaeth."

My experience with regard to *H. nemoralis* was somewhat disappointing. I had expected to obtain good series of varieties, but the "swarms" were absent; they had either migrated, or greatly decreased. I searched the hedgerows and ditches, but for a long time with poor success. One very wet day, with perfect hygrometric conditions, I eventually discovered a solitary snail, and by diligently searching the grass and nettles, came across odd ones here and there, and after nearly two hours' work obtained about two dozen. The snails were difficult to find, but the greater number had crawled up the stems of tall reeds, which grew in a deep ditch (Conway Road), and as they hung from the leaves or clung to the stems were scarcely discernible. A curious fact about these snails on the reeds was how they managed to get there at all, as the bottom of the ditch contained nearly a foot of water. Probably they had ascended the stems when the ditch was dry. Altogether I collected ninety specimens from the same place during my three weeks' stay, but quite four-fifths of the number were found clinging to or crawling up the reeds in rainy weather.

In 1915 I again explored this ditch, but the reeds had a short time previously been cut down, and I only obtained about half-a-dozen shells from the grass on each side. In a field where the reeds in another drain had not been cut, I failed to find a single shell, although the place seemed in all respects identical and suitable.

Now, ninety shells are not many to find after diligent search on many occasions, so that in 1901 *H. nemoralis* could not be said to swarm; and after an absence of another fourteen years, my opinion has not altered. Either *H. nemoralis* is becoming rarer in the district, or my idea of swarms of snails does not coincide with that of Mr. Roebuck.

In 1901 I explored many other parts of the district, particularly the Morfa area, but only found shells in one or two other places in the immediate vicinity of Llandudno, viz., on the walls and rocks skirting the Marine Drive on the Great Orme, and sparingly among the vegetation (brambles and marram grass) on the sand dunes of the Conway shore, south-west of the Morfa. In 1915 I gave this latter locality more careful and systematic attention, and on suitable days found *H. nemoralis* commoner here than elsewhere; the var. *castanea* being decidedly predominant, yet even here the species could

Agriolimax agrestis (Linné).—Common everywhere.

Vitrina pellucida (Müller).—Not common. Gloddaeth Woods (two dead, one live, young); Great Orme, the Morfa.

Vitrea crystallina (Müller).—Not common. Gloddaeth Woods, Bodscallan Woods, Great Orme.

Vitrea cellaria (Müller).—Fairly common. Gloddaeth Woods, Little Orme, Bodscallan, Tal-y-Cafn, Llangwystenin, Llandrillo-yn-Rhos, Llanrwst, Conway Road (one dead).

var. *albina* Moquin-Tandon.—Rare. Happy Valley, Great Orme.

Vitrea rogersi B. B. Woodward.—Common in many places. Gloddaeth Woods, Eglwys Rhos, Little Orme, Tal-y-Cafn, Llangwystenin, Llandrillo, Llanrwst.

Vitrea alliaria (Müller).—Not abundant. Great and Little Orme, Gloddaeth Woods and Mountain, Bodscallan, Rhos Fynach, Tal-y-Cafn, Tan-r-allt.

Vitrea nitidula (Draparnaud).—Fairly abundant. Bodscallan, Gloddaeth Woods, Llandrillo, common at foot of Little Orme.

Vitrea pura (Alder).—Rare. One specimen in Gloddaeth Woods, Great Orme (Tomlin).

Euconulus fulvus (Müller).—Rare. One locality only, Gloddaeth Woods.

Arion ater (Linné).—Abundant. Bodscallan, Llangwystenin, Conway Road, Great Orme, Gloddaeth Woods.

var. *rufa* (Linné).—One specimen from Bodscallan.

Arion hortensis Férussac.—Not common. Bodscallan, Gloddaeth Woods, Llandrillo-yn-Rhos.

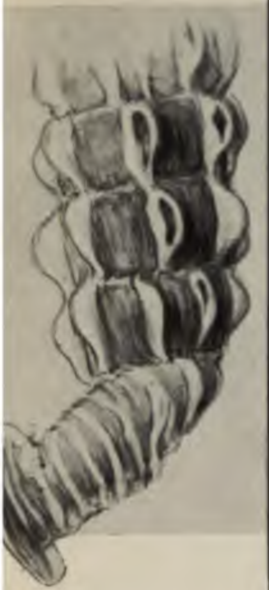
Punctum pygmæum (Draparnaud).—Rare. One at Bodscallan.

Pyramidula rupestris (Draparnaud).—Locally common. Great Orme, Gloddaeth Woods and Mountain, Bodscallan.

Pyramidula rotundata (Müller).—Common. Church walks, Llandudno, Great Orme, Llandrillo, Bodscallan, Llangwystenin, Tal-y-Cafn, Llanrwst.

var. *turtoni* Fleming.—Gloddaeth Woods. These shells are beautifully iridescent when viewed with artificial light.

(To be continued).



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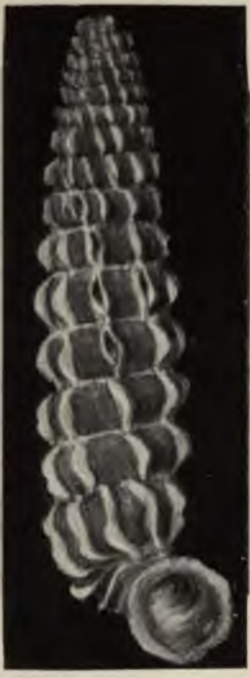

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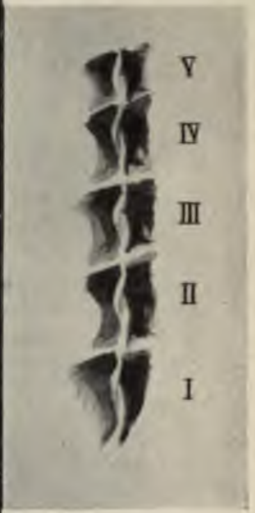

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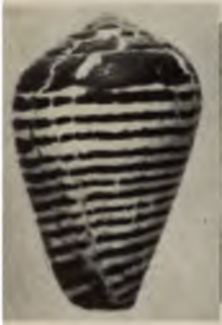

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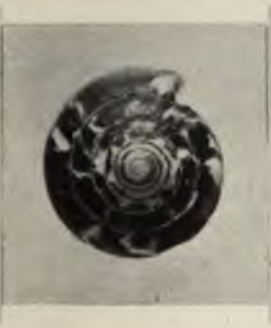

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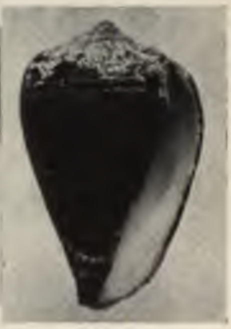

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FIG. 1.—*Brachypodella nidicostata* sp. nov., × 9.
„ 2.— „ „ × 5⅓.
„ 3.— „ „ (axis), ×
[*Del. ad nat., J. D. Dean*].
(*See page* 86).

FIG. 4–6.—*Conus chytreus* Melvill, × 2.
[*Photo. J. W. Jackson.*]

THE

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The New Members, Resignations, Deaths, and Members Struck Off the List will be found in the Proceedings, pp. 121—124, and 159—164.

◆

Helicella barbara (L.) new to West Sussex.—A flourishing colony of this species was observed by Miss Robinson, of Saddlescombe, Sussex, on the downs north of Brighton in 1917. I visited the spot this winter and found the species in abundance for about a quarter-of-a-mile. The varieties include *bizona*, *flammulata*, *grisea*, *strigata*, and *elongata*. Some are of remarkable size, and Mr. H. S. Toms, of the Brighton Museum, to whom I am indebted for information, has found specimens up to 24 mm. in length.—R. WINCKWORTH. (*Read before the Society*, May 12th, 1920).

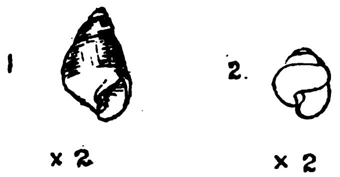
◆

ON OBELISCUS (PROTOBELISCUS) RIPARIUS (Pfr.).

By GEO. C. SPENCE.

(Read before the Society, May 14th, 1919).

Mr. Collier recently kindly handed to me for investigation a series of the above from Antioquia Prov., Colombia, which he had obtained from the DaCosta Collection. From the dried remains of the animals I secured a number of embryonic shells which consist of four nearly flat whorls, spire conical, columella twisted and obliquely truncate. Colour pale horn, with numerous distinct white spiral bands. (In well-preserved adults traces of this banding—which does not extend to the post-natal growth—may be observed in the form of apparently incised lines). Size: height, 7 mm.; breadth, 4·5 mm.



1. *Obeliscus riparius* (Pfr).
2. *Obeliscus cuneus* (Pfr.).

Embryonic shells, *del. ad nat.* G.C.S., 22/9/19.

The part-grown and adult shells differ and are distinguishable at a glance from *O. cuneus* (Pfr.). As Dr. Pilsbry in the Manual, vol. xviii, page 253 (apparently from his remarks not having specimens of *riparius* before him) reduces *riparius* to a variety of *cuneus*, I sent the shells to Mr. Tomlin, asking him to compare them with those (probably Pfeiffer's types) in the Cuming Collection in the British Museum. He kindly writes me that they are identical. The differences in the embryos (see annexed figures) alone prove the distinctness of the two shells, and suffice to re-establish *riparius* as a species; but as the original description was evidently made on immature specimens it is as well to add that the mouth of *riparius* is oblique, as in *O. major* Mill, instead of vertical, as in *cuneus*.

OBITUARY NOTICE: EDWARD COLLIER.

By R. STANDEN.

(Read before the Society, June 9th, 1920).

By the death of Edward Collier, on 25th April last, the Society loses one of its oldest and most valued members. For a long time he had been in failing health, but until the last retained his vivid interest in the Society. He will be greatly missed by all who knew him, his delightful companionship and cheery and helpful disposition making him popular with everyone.

Collier was born at Woodley, near Hyde, on May 5th, 1846. He very early developed an ardent love of natural history in all its branches, which culminated in especial devotion to the non-marine mollusca. His favourites were *Helicidæ*, Land Operculata, and *Clausilia*. The study of geographical distribution interested him greatly, particularly the problems connected with insular molluscan faunas. He had an extensive correspondence with leading conchologists both at home and abroad, and further enriched his series by purchases at the sales of famous collections. He also collected extensively in many parts of England, and on the continent, and made many excursions to Ireland. Sometimes we joined the Triennial Excursions of the Irish Field Clubs, or with other friends penetrated into remote and unworked districts in the north, west, and south. The results were published in the *Journal of Conchology* or *The Irish Naturalist*. The memory of the delightful times we had together will remain evergreen in the writer's memory!

No one who was privileged to inspect his collection could fail to be impressed by the painstaking care shown in the selection of specimens, and the neatness and beauty of their display. Only the very best satisfied him. It is satisfactory to note that it will not be dispersed, having been bequeathed to his only son Frank.

Mr. Collier joined the Conchological Society in 1880, and served on the Council, and then as Vice-President for many years. Although often pressed to accept the Presidency, it was only very recently that his innate modesty was overcome, and he was elected President in 1919. He was a member of the Malacological Society of London, and the Lancashire and Cheshire Antiquarian Society.

In February, 1888, he invited local conchologists to meet at his house, and "The Manchester Conchological Club" was inaugurated, with the late Mr. R. D. Darbishire as President; Mr. Collier, Treasurer; and the writer as Secretary. The club soon grew into a strong body of enthusiastic workers, and in August of the same year was constituted a first Branch of the Conchological Society. It continued its activities, under the above-named officers, until the transference of the headquarters of the parent Society from Leeds to Manchester in 1895.

Mr. Collier was buried at Brooklands Cemetery on 28th April last in the presence of many sorrowing friends, this Society being represented by J. Wilfrid Jackson, G. C. Spence, and myself.

LIST OF NOTES AND PAPERS.

A white variety of *Limnæa palustris* at Southport.—*Journ. of Conch.*, vol. i, 1876, p. 130.

Helix villosa Drap. as a British species.—*Ibid.*, vol. iv, 1884, p. 214.

Planorbis dilatatus Gould.—*Ibid.*, vol. iv, 1884, p. 217.

Shells collected at Llandulas, North Wales.—*Ibid.*, vol. iv, 1885, p. 367.

Land and Freshwater Mollusca of Cardiganshire.—*Ibid.*, vol. v, 1888, p. 353.

Helix rupestris, an ovo-viviparous species.—*Ibid.*, vol. vi, 1889, p. 45.

Notes on a Conchological Excursion to the West of Ireland.—*Ibid.*, vol. viii, 1895, p. 42.

Pupa anglica Fér. var. *alba* nov.—*Ibid*, vol. ix, 1898, p. 152.

Reversed Helices recently found in Lancashire.—*Ibid.*, vol. ix, 1901, p. 91.

The Section Placostylus of the Genus Bulimus.—*Ibid.*, vol. ix, 1902, p. 208.

Land Shells at High Altitudes.—*Ibid.*, vol. xi, 1904, p. 55.

The Conchological Differences between the Genera and Sections of the Pupininæ.—*Ibid.*, vol xi, 1904, p. 110.

Helix nemoralis L. in North-west Donegal.—*Ibid.*, vol. xii, 1909, p. 290.

Notes on the Section Tachea of *Helix*.—*Ibid.*, vol. xiv, 1913, p. 118.

Helicigona lapicida (L.) in Ireland.—*Ibid.*, vol. xiv, 1914, p. 160.

Reminiscences and Practical Hints on Collecting (Presidential Address).—*Ibid.*, vol. xvi, 1920, p. 77.

In collaboration with R. Standen :—Further Conchological Notes from the West of Ireland.—*Ibid.*, vol. viii, 1896, p. 177.

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THE NON-MARINE MOLLUSCA OF LLANDUDNO AND DISTRICT.

(Continued from p. 132).

By H. BEESTON.

(Read before the Society, March 14th, 1917).

Helicella virgata (Da Costa).—Very abundant. With *H. barbara* this species is fairly ubiquitous all over the Llandudno peninsula. Near the sea it is rather small, but inland it attains a larger size, although on the sand-hills and golf-links of the Conway side of the Morfa it seems to thrive better and grow larger than on the opposite side, possibly owing to food being more plentiful, and the situation more sheltered. Away from the peninsula the species is not so prolific and often smaller. Other localities: Llandrillo, Llangwystenin. The following varieties were noted:—

var. *pellucens* Sh.	Great Orme, near the disused copper mines, golf-links, Conway shore.
var. *roseozonata* (?)	
var. *minor* Taylor	
var. *lutescens* Moq.	Conway Road.
var. *leucozona* Taylor	Golf-links and sand dunes.
var. *albicans* Grateloup	
var. *tessellata* B.-Ch.	
var. *subalbida* Poiret	Conway shore.
var. *hyalozona* Moq.	
var. *hypozona* Moq.	
var. *submaritima* DesMoul.	
var. *ochroleuca* Moq.	
m. *subscalariforme*	

In 1901 there was quite a number of this monstrosity, but by 1915 it seemed to have almost died out.

The light-coloured forms mentioned by Mr. Roebuck in 1883—those I have named *roseozonata*—still persist and are the predominant variety after thirty-one years. The shells with black bands, *i.e.*, type form, are also quite common.

Helicella itala (Linné).—Extremely rare even if existent (1915). There seems to be something very curious about the occurrence of this species at Llandudno. In 1884 (*Journ. of Conch.*, vol. iv, p. 200) Mr. Roebuck says:—" I am rather surprised that in a limestone district like that around Llandudno I did not meet with more forms. I had quite anticipated finding such things as *Helix erice-*

torum (=*itala*)." Two years later, 1886 (*Journ. of Conch.*, vol. v, p. 28) Mr. Tomlin, in recording *H. itala*, says:—"Plentiful, but local, in various parts of the Morfa with var. *alba*. I am rather surprised that Mr. Roebuck missed *H. ericetorum*, as it seemed well disseminated, though not ubiquitous, on the Morfa." It is rather strange that my experience should coincide with that of Mr. Roebuck. I spent three weeks in 1901, and the same in 1915, at Llandudno, but failed to discover a single shell with the exception of one dead specimen, which I picked from the side of a section of sand-hill, quite a foot from the surface. My conclusion is that, for some inexplicable reason, the species is very erratic in appearance, and Mr. Tomlin was fortunate enough to find it when the animals were plentiful and on the crawl. There are evidently climatic or other causes, which, if we only knew, will account for the phenomena. In any case, the animals are almost (in some cases quite) exterminated for a considerable time. If such untoward accidents (parasites, severe frosts, increase of birds, rodents, etc.), occur, it would take several years for a once-thriving colony to recover itself. An instance of this kind occurred in my experience a few years ago. On the side of a somewhat bare down, I found dead shells of *H. itala* for several seasons in succession, but no live ones, although I searched under all kinds of climatic conditions. For two or three years I did not visit the place, but one muggy, damp day I found a large number crawling about, most of them in one small area. The following season the animals had greatly increased and spread, and continued thus for two or three years afterwards. Then they again apparently disappeared, and only dead shells were to be found for several seasons. Again followed a resurrection, beginning with a few individuals, which have since increased to a fair-sized colony. In this instance probably two or three nights' continuous frost nearly annihilated the snails which were most exposed, only those escaping which were hibernating or in some degree protected. Late autumn seems to be the season when this snail exposes itself most, and is thus affected most severely by sudden changes of temperature. May not something of this kind happen to *H. itala* at Llandudno?

var. *alba* Charpentier.—Found with type (Tomlin).

Helicella caperata (Montagu).—Common. Sand-hills and golf-links, Great Orme, Conway Road, Nant-y-Gamar Road, Llandrillo, Rhos Fynach, Llangwystenin, Llanrwst.

var. *ornata* Picard.—Great Orme.

var. *alba* Picard.—Morfa (one specimen).

Helicella heripensis Mabille.—Conway Road (one specimen).

Helicella barbara (Linné).—Very abundant. Found in association with *H. virgata.* It was exceedingly plentiful on stones in the bay between the two Ormes, and at high tides was frequently submerged, but did not seem to suffer. Golf-links, Nant-y-Gamar Road, summit of Little Orme.

var. *strigata* Menke.—Sand-hills and golf-links.

var. *inflata* Moq.—Sand-hills and golf-links.

Hygromia granulata (Alder).—Common, but local. Eglwys Rhos, Bodscallan and Gloddaeth Woods, Tywyn.

var. *albida* Tye.—Gloddaeth Woods.

Hygromia hispida (Linné).—Sparingly distributed. Little Orme, Llandrillo, Eglwys Rhos, Gloddaeth Woods and Mountain, Bodscallan, Llangwystenin, Rhos Bay.

var. *albida* Jeffreys.—Little Orme, Eglwys Rhos.

var. *subrufa* Moq.—Conway Road, Eglwys Rhos.

Hygromia striolata (Pfeiffer).—Rather scarce. Sand-hills and golf-links, Abbey Road, Nant-y-Gamar Road, Rhos Fynach.

var. *rubens* Moq.—Mostyn Avenue (one).

var. *albocincta* Cockerell.—Mostyn Avenue (two).

var. *alba* Moq.—Mostyn Avenue (one).

Acanthinula aculeata (Müller).—Rare and local. Great Orme. Mr. Tomlin records ten specimens from this locality; I failed to find any.

Vallonia pulchella (Müller).—Not common and local. Great Orme (several), Tywyn (one), Bodscallan.

Vallonia costata (Müller).—Much more frequent than *V. pulchella.* Gloddaeth Woods, Bodscallan, Great Orme (Tomlin).

Helicigona lapicida (Linne).—Recorded by Mr. A. J. Nixon in 1888 and 1889 for Llandudno district; exact locality not stated.

Helix aspersa Müller. Common in most parts of the district. Great Orme, Conway Road, Nant-y-Gamar Road, sand-hills and golf-links, Abbey Road, Marine Drive, Llanrhos, Gloddaeth Woods, Llandrillo, Tal-y-Cafn, Llangwystenin, Rhos Fynach.

var. *conoidea* Picard.—Llanrhos (one); Great Orme (one).

var. *globosa* Moq.—Gloddaeth Woods (one).

var. *tenuior* Sh.—Great Orme (one).

var. *undulata* Moq.—Great Orme (one); Llanrhos (one).

var. *flamm*[illegible] Picard.—Conway Road, Nant-y-Gamar Road, Gl[illegible]s, sand-hills and golf-links.

var. *albofasciata* Jeffreys. — Great Orme (one); Gloddaeth Woods (one); Llanrhos (one).

var. *zonata* Moq.—Great Orme (one); golf-links (two).

var. *grisea* Moq. (?)—Sandhills (one).

var. *semifusca* Cockerell.—Llanrhos (one).

var. *lutescens* Cockerell.—Llanrhos (one).

var. *obscura* Moq.—Great Orme (one).

var. *minor* Moq.—Marine Drive, Eglwys Rhos.

Band-forms 12345, 1(23)45, (12)345.

Helix nemoralis Linné.—Well distributed, but not abundant. Llandudno Morfa, Nant-y-Gamar Road, Bryneau Road, Conway Road, sand-hills and golf-links, Gloddaeth Woods, Llandrillo, Llangwystenin, Little Orme, Tal-y-Cafn, Rhos Fynach.

var. *conica* Pascal.—Conway Road (one).

var. *roseolabiata* Taylor (00300).—Sandhills (two), Morfa, Gloddaeth Woods.

var. *bimarginata* Moq.—Conway Road, Nant-y-Gamar Road, golf-links. (This variety was fairly common).

(a). var. *rubella* Moq.—Conway Road, Nant-y-Gamar Road, sand-hills and golf-links, Gloddaeth Woods.

var. *libellula* Risso.—Conway Road, Nant-y-Gamar Road, sand-hills and golf-links.

(b). var. *albina* Moq.—Gloddaeth Woods (one); Nant-y-Gamar Road (one).

(c). var. *castanea* Moq.—Golf-links and sand-hills (the chief station for this variety). It was often banded more or less obscurely and existed in small colonies. Nant-y-Gamar Road, Conway Road (one).

(d). var. *olivacea* Risso.—Sand-hills and golf-links (scarce), Conway Road.

var. *roseozonata* Cockerell.—Gloddaeth Woods (rare, one).

var. *hyalozonata* Taylor.—Conway Road (one), Morfa.

var. *undulata* Gentiluomo.—Conway Road (one), sand-hills.

var. *aurantia* Cockerell. — Conway Road (one), Gloddaeth Woods.

Quite a number of shells were combinations of the above varieties. Thus *a*, *b*, *c*, *d* above could only be adequately described as :—

(*a*). *rubella-bimarginata-roseozonata.*
(*b*). *albina-roseolabiata-roseozonata* (00300).
(*c*). *castanea-bimarginata.*
(*d*). *olivacea-bimarginata.*

The band-forms were many and curious, some of them rare when taken in conjunction with the colour variations

Helix hortensis Müller.—Rare. I include this species in the list on the authority of Mr. C. E. Wright and Mr. A. J. Nixon. Mr. Wright reports :—"Type only ; all very much weathered, bad specimens," but does not give locality; August, 1907. Mr. Nixon records two varieties in August, 1888, viz. :—var. *lurida* Moq., and var. *arenicola* Macg., but gives no locality.

Neither Mr. Roebuck nor Mr. Tomlin refer to *H. hortensis* as being found at Llandudno, and it is very evident this species is very rare in the district.

Ena obscura (Müller).—Not abundant. Gloddaeth Woods and Mountain, Eglwys Rhos, Bodscallan, Llandrillo.

Cochlicopa lubrica (Müller).—Generally distributed. Gloddaeth Woods, Great and Little Orme, Eglwys Rhos, Bodscallan, Llangwystenin, Llandrillo, Rhos Bay, Tal-y-Cafn, Llanrwst.

var. *lubricoides* Fér.—Little Orme, Gloddaeth Woods, Llanrwst.
var. *fusca* Moq.—Gloddaeth Woods.
var. *hyalina* Jeffr.—Gloddaeth Woods, Great Orme, Tall-r-alt.

Azeca tridens (Pulteney).—Very local. The only record of this species for the district is given by Rimmer as Great Orme.

Since writing this note, Mr. Tomlin informs me that he has often found this species in "some little copses (mainly of hazel) on the Great Orme. It was not uncommon among damp moss and dead leaves."

Jaminia cylindracea (DaCosta).—Abundant. Great and Little Orme, Church Walks, Invalids' Walk, Gloddaeth Woods and Mountain, Tywyn, Eglwys Rhos, Bodscallan, Llangwystenin, Llandrillo.

var. *edentula* Moq.—Bodscallan.
var. *curta* Westerlund.—Gloddaeth Woods.
var. *albina* Moq.—Gloddaeth Woods.

This last variety abundant with type on a stretch of stone wall skirting the Gloddaeth Woods near Llanrhos.

Jaminia muscorum (Linné).—Recorded by Mr. A. J. Nixon for Llandudno district in 1889 ; Great Orme (Tomlin).

Vertigo antivertigo (Draparnaud).—Scarce. Dry ditch on Morfa (Tomlin) ; Gloddaeth Woods (Tomlin).

Vertigo pygmæa (Draparnaud).—Sparingly distributed. Great Orme, Little Orme, Penrhyn Farm.

Balea perversa (Linné).—Scarce. Gloddaeth Woods, Bodscallan.

Clausilia laminata (Montagu).—Recorded by Mr. Nixon for Llandudno district in the year 1889.

Clausilia bidentata (Ström). — Fairly abundant. Great and Little Orme, Eglwys Rhos, Gloddaeth Woods, Bodscallan, Llangwystenin, Llandrillo.

var. *tumidula* Jeffreys.—Gloddaeth Mountain.

Succinea putris (Linné).—Not common. Sides of streams in Gloddaeth Woods, Bodscallan.

Succinea elegans Risso.—Local and scarce. Wet places by road-sides between Llandudno and Eglwys Rhos.

Carychium minimum Müller.—Local and scarce. Woods at Bodscallan, Great Orme.

Limnæa pereger (Müller).—Local and scarce. Disused clay-pits near railway-station; also small pond by road-side near Maesda Farm, Conway (C. E. Wright). Morfa (Tomlin), extinct here now, Eglwys Rhos, Deganwy, water-trough on Great Orme.

var. *vulgaris* (=*minor*) C. Pfeiffer
var. *oblonga* Jeffreys - -
var. *fontinalis* Studer - -
var. *lacustrina* Clessin - -

Clay-pits near railway-station, Llandudno.

Limnæa truncatula (Müller).—Local and scarce. Ditch on Morfa (now a sewer); pond, Happy Valley (now disappeared). Two very small specimens in a wet place by the side of footpath to Bryneau Farm. "Stream near Llandudno" (Mr. C. E. Wright, 1907).

Planorbis albus Müller. — Fairly plentiful. Clay-pits near railway-station, Llandudno.

Planorbis spirorbis Linné.—Scarce. Clay-pits as above.

Pomatias elegans (Müller).—Sparingly distributed. Nant-y-Gamar Road (two); Gloddaeth Woods (common).

Mr. Roebuck recorded this species in 1877 on Great Orme's Head, but in 1883 failed to find one. No trace of it now (1915), so conclude that it has completely died out at this place.

var. *ochroleuca* Moq.—Gloddaeth Woods.
var. *purpurascens* Moq.—Gloddaeth Woods.
var. *pallida* Moq.—Gloddaeth Woods.
var. *fasciata* Picard.—Gloddaeth Woods.

Sphærium lacustre (Müller).—Rare. Pond at foot of Deganwy Hill, 1877; pond, Abbey Road (none now, 1915).

The paucity of freshwater species is owing to the lack of streams, ponds, etc., in the district. There was a time when the Morfa no doubt had many wet ditches, but these no longer exist, and the only drain of importance left is choked with rubbish and foul.

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Limnæa stagnalis destroyed by Rats.—Whilst searching for specimens along the banks of a pond near Ashley Mill (Cheshire) during 1919, I came across two or three small pockets or hollows filled with the dead and damaged shells of *Limnæa stagnalis*. On examination I found these had all been broken in a similar manner, a portion of the body whorl having been removed by some creature, evidently with the object of devouring the animal. I visited the spot on several subsequent dates, and discovered further larders, one of which was situated in a tuft of rushes, and contained over fifty dead shells. The water at the edge of the pond near these larders is very shallow and full of weed, and in season literally alive with scores of *L. stagnalis* in all stages of growth. An examination of the soft mud showed the footprints of rats, whilst a well-worn track led from the water's edge to the large larder already mentioned. As the water-vole is supposedly a vegetable feeder and has not been observed on this pond, whilst rats are commonly seen around it, the evidence is sufficiently strong to point to the latter as the enemy which is destroying large numbers of this mollusc.—A. K. LAWSON. (*Read before the Society*, February 11th, 1920).

Clausilia biplicata Mont. **in Essex.**—I am glad to be able to record a new station for this extremely local British mollusc. When on my way to Grays, Essex, on September 5th last, in order to search for *Assiminea grayana* and other brackish water species which occur there, I took the opportunity of visiting Purfleet in order to explore the large chalk pit there. Finding it impossible to do so, however, owing to its occupation by the military, and having some time to wait on getting back to the railway station, I commenced to search a somewhat unlikely-looking chalky bank in its vicinity, when, much to my surprise, I almost at once turned out an example of *Clausilia biplicata* from amongst the chalk débris. Further search revealed the presence of a fair-sized colony, including young and dead shells. Assuming this is not an introduction by some conchologist (I know of no one likely to have introduced it), the species is an addition to Mr. Wilfrid Mark Webb's excellent county list (The Non-Marine Mollusca of Essex, *Essex Naturalist*, 1896, pp. 27—48 and 65—81), and the locality is also a considerable extension of its hitherto known range in the Thames Valley. I think it as well to take this opportunity of calling attention to a record of *Cl. biplicata* from Gloucestershire (Leckhampton Hill) which appeared in this *Journal* for 1913 (vol. 14, p. 57), as this owing to its having been included without remark in a list of census records is very likely to be overlooked. I think it would have been better in the case of a species with such a restricted British range if this record had been made the subject of a separate note.—F. B. JENNINGS, 1st January, 1920. (*Read before the Society*, February 11th, 1920).

EVOLUTION IN THE MOLLUSCAN RADULA.

BY THE REV. A. H. COOKE, SC.D., F.Z.S.

(Presidential Address delivered at the Annual Meeting, October 16th, 1920).

THOSE familiar processes of development, by which modifications are brought about in one or more parts of an organism, appear to have acted upon the digestive implement, which in the mollusca is called the *radula*. It may be interesting to endeavour to bring together some of the facts which bear upon evolution as seen in this important organ.

The radula is one of those many devices by which an animal breaks up its food before subjecting it to the processes of digestion. To swallow the food whole was probably the rule in very early stages of animal development, and still persists in certain cases. But in time, the advantages of a digestive system whose functions were more specialised must have established themselves, and various mechanical means were evolved for masticating, triturating, carding or otherwise mincing up the food, before it passed into the digestive tract. Hence the origin of teeth in the widest sense, whether set in a jaw, in the roof or sides of the mouth, on a tongue, or on a special organ distinct from any of these. To some such process of development must be ascribed the origin of the molluscan radula.

The oldest known form of radula is believed to be that of the Rhipidoglossa, a section containing, amongst marine groups, *Turbo*, *Trochus*, *Haliotis*, *Fissurella*, *Nerita*, amongst the land forms *Neritina*, *Helicina*, and *Proserpina*. Its characteristic is the multiplication, to an indefinite number, of identical small ribbon-shaped marginal teeth. To this section belongs also *Pleurotomaria*, a genus long regarded as extinct, four living species of which have been discovered within the last sixty years. *Pleurotomaria* first appears in the Cambrian epoch, and more than four hundred species are known from Palæozoic strata, since which age it has gradually diminished in numbers. There can thus be no doubt that in the radula of *Pleurotomaria*, which is markedly rhipidoglossate, we have an extremely early form, exhibiting the multiplication of many identical or nearly identical teeth. It seems only natural to hold, on *a priori* grounds, that when an organ like the radula was developed, it was furnished at first with teeth of small or even minute size, the gradual coalescence or fusion of which gave rise, in process of time, to teeth of larger size and more effective cutting capacity.

The evidence of the geological record supports this view. The Rhipidoglossa appeared first, earliest of all radula-bearing Gasteropoda (in the Lower Cambrian), the Tænioglossa, with fewer and relatively larger teeth next (in the Upper Cambrian), while the Rhachiglossa, with their few, sabre-like teeth, are scarcely known for ages later (in the Cretaceous), and do not become dominant till the Tertiary epoch. It is a significant fact, that shells of mollusca in the palæozoic strata are said to show no indication of the perforations due to carnivorous mollusca, so common in our own and Tertiary times.

It appears probable that archaic univalve mollusca, whether breathing by gills or lungs, whether [1] marine, freshwater, or land, were vegetable feeders; carnivorous habits were a development of later date. The great molluscan land carnivora, *e.g.*, the South African *Aerope*, the Central American *Euglandina*, and the Neozealanian *Paryphanta*, represent a comparatively recent phase of progression. Food material that is soft and yielding, and which makes no effort to escape its captor, can be satisfactorily held and broken up by a jaw to bite and a number of small teeth to card and mince. Flesh-diet is another matter, especially living flesh, which not only needs stronger and sharper carving-knives to cut it up, but something prehensile to hold it still, and neutralise its struggles to escape.

The land Pulmonata, being more accessible to observation than the marine groups, provide us with excellent illustrations of the fact that transition from a vegetable to a flesh diet is accompanied by a parallel process of evolution in the form of the teeth, on the lines indicated above. Although the conditions of life under which the marine groups live preclude equally exact observation, yet the argument from analogy can be effectively employed in their case, and we can hold that the possession of a radula armed with strong knife-blades is a presumption in favour of the owner being addicted to a carnivorous diet, particularly when his near relations on the shore, whom we can see feeding on flesh, happen to be furnished with teeth of a like nature.[2]

Thus at one end of the series of land Pulmonata we have the feeders on vegetable matter, whether green or rotten (*Helicidæ*, *Bulimulidæ*, *Urocoptidæ*, *Pupidæ*, *Stenogyridæ*, etc.), all of which have, in addition to a jaw or jaws, very numerous small, usually square-based, unicuspid or pluri-cuspid teeth, set on each side of a small median tooth. Next come the *Limacidæ* (*e.g.*, *Limax*, *Vitrina*, *Polita*, *Zonites*) a group whose members are known to vary a vegetable diet with flesh-eating on occasion. Here the marginals are profoundly modified, becoming narrower, sharply pointed, uni- or bi-cuspid. In certain cases (*Polita*) the number of teeth in a row is reduced, while the size is increased, and the extreme marginals closely resemble those of *Glandina* and *Testacella*.

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[1] *Natica* however, or what seems to be *Natica*, a carnivorous Tænioglossate, occurs in very ancient strata. Probably its carnivorous habits are of more recent development.

[2] The Opisthobranchiata and Nudibranchiata, with their variable and complicated radulæ, have been omitted from this discussion altogether.

What happens in the case of the radula of the confirmed carnivora (*Glandina*, *Streptaxis*, *Streptostele*, *Gibbus*, *Rhytida*, *Daudebardia*, *Testacella*, etc.) has been well discussed by Hugh Watson in his paper on "The Carnivorous Slugs of South Africa."[1] "In the subspecies of *Apera gibbonsi*," he says, "the typical form has the most primitive type of radula, and the others show a progressive adaptation to carnivorous habits. . . A slug that feeds on worms uses its radula . . . for catching hold of its victim, and drawing it back through the mouth into the crop. For this purpose the teeth must be large, with long sharp points for piercing the worm's skin . . . they must be shaped so as to retain their position in the skin of the worm when they are pulling it back into the mouth. Accordingly we find, first, a progressive increase in the size of the larger teeth compared with the size of the animal, and especially in the length of their cusps. And in order to make room for these, the outward edges of the radula, as well as those [teeth] down the centre, become still less and eventually disappear." He goes on to show how the shape of the teeth becomes modified in order to prevent the worm from escaping. In one subspecies the cusps are curved into hooks and slightly broadened towards the points; in another they are barbed on the lower side, as in *Testacella*; in a third, all the larger teeth are doubly barbed, one barb being nearer the point of the tooth than the other.

As further illustrating the process of development, it may be added that the genera *Daudebardia*, *Selenites*, and *Plutonia* retain a modified limacidan jaw combined with a markedly testacellidan radula.

Among the carnivorous marine mollusca, the Toxoglossa (*Conidæ*, *Terebridæ*, *Cancellariidæ*, *Turridæ*, etc.), exhibit a radula which, as a rule, consists of sword-shaped marginals only, median and lateral teeth having been lost. To compensate for this loss, or perhaps it would be more correct to say as occasioning it, the surviving marginals are often very large, gathered in one or two bunches, and in *Conus* hooked, barbed, and furnished with a poison gland and duct. The 'bite' of some species of *Conus* will draw blood from a man's hand. *Clavatula* retains a small central tooth. One group alone of the *Turridæ* (*Spirotropis*) retains both median and lateral teeth, flanked by the sword-shaped marginals, thus giving the clue to the true explanation of what has taken place in the Toxoglossa as a whole.

. The Rhachiglossa are distinguished by a radula in which there is a central tooth, flanked by a single lateral on each side, but no marginals (formula 1.1.1). The median tooth is usually smaller than the laterals, and its cusps weaker; the cusps of the laterals are often powerful sabre-like weapons, and, although never barbed, are sometimes hooked at the apex (*Oliva*).

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[1] Ann. Natal Museum, III, 1915, p. 158.

The most primitive radula-form in this group is that of the *Fasciolariidæ*, *Fusinæ*, and *Mitridæ*, where the laterals are broad, comb-shaped, and multicuspid, while the median tooth is small, and, as a rule, weakly armed. Here, as so often, increased power in one member of the row seems to be accompanied by the weakening of another member, or by its complete extinction. Thus *Voluta* and *Marginella* lose both laterals and marginals; sometimes the process is reversed, and, as seen in the Toxoglossa, medians and laterals disappear, while marginals increase in size; sometimes (*e.g.*, in the *Fusinæ*) intermediate stages are seen, when powerful laterals have almost extinguished the weak and in some cases scarcely discernible median tooth. Sometimes (certain species of *Mitra*) the laterals are denuded of cusps, while the cusps of the median tooth are strengthened.[1] The same principle, that an organism economises energy, saves on one part what it gains on another, is seen in the land Agnatha, *e.g.*, in *Rhytida kraussi* Pfr., from the Cape, where a huge development of the external marginal is accompanied by a marked weakening of the other teeth in the row.

In the Rhachiglossa we have further indication that homologous parts tend to cohere, that large cusps are formed by the coalescence of small ones. *Alectrion* retains a median tooth with numerous small cusps, while in many species of the allied genus *Phos* the cusps in the median have fused into three. *Vexillum* (formerly *Turricula*) falls into two groups, in one of which numerous very small cusps arm the median tooth : in the other group all these have coalesced into three, placed in the centre of the margin. Single-cusped laterals are probably due to the fusion of two, three, or more cusps in earlier forms.

Certain cases occur in which, for reasons at present unknown, the teeth are unciform, suggesting carnivorous habits, but their number is greatly multiplied, with no definite median tooth, and no distinction between laterals and marginals. This form of radula is illustrated by *Epitonium* (*Scalaria*) and *Ianthina*, and recalls, in general appearance, the radula of *Testacella*. Some one ought to find out on what [2]*Ianthina* feeds. Is it the *Velella* with which it associates?

Perhaps, of all the radulæ known to us, that of the *Volutidæ* is the most interesting, illustrating as it does the process of evolution which has gone on in that genus, and enabling us to infer by analogy what may have happened in other genera.

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[1] A. H. Cooke in Proc. Zool. Soc., 1919, pp. 405—422.

[2] Since writing the above, I find that Jeffreys (Brit. Conch., iv, p. 176) has collected abundant evidence that *Ianthina* is carnivorous, feeding on *Velella*, other *Ianthina*, *Physalia*, *Porpita*, and *Lepas*.

Nearly all the known *Volutidæ* (*Cymbium*, *Melo*, *Voluta*, *Lyria*, *Amoria*, *Volutomitra*, *Halia*) have a radula consisting of a single strong tricuspid median, with no laterals or marginals. G. Schacko discovered[1] that a lateral is present in *V. concinna* Brod., consisting of a single large triangular cusp covering a broad base.

A further stage back is seen in *Volutilithes abyssicola* Ad. and Rve., in which the single cusp is placed at one end of the oblong lateral, from the rest of which must have perished the other cusps which once covered the margin, as in the parallel case of certain of the *Mitridæ*. In yet another species (*Neptuneopsis gilchristi* Sowb.) Pace has found[2] traces of a vestigial lateral, cuspless, of a highly tenuous and degraded character. Further, it can hardly be doubted that in the multicuspid median of *V. musica* L. we have a survival of a more ancient form of volutidan radula, before the small cusps on that tooth cohered into the strong tricuspid form, but in which the laterals seem to be entirely lost.

A further stage of progression is seen in the groups *Amoria* and *Volutomitra*. Here the tricuspid median has become unicuspid, while the 'wings' of the framework are greatly prolonged. In *Halia* the radula is very small, and very narrow in proportion to its length, with a small median, shaped as in *Amoria*, and a doubtful lateral on each side; probably a case of general degradation. Finally, four species of *Voluta* (*dohrni* Sowb., *dubia* Brod., *gouldiana* Dall, *junonia* Lam.) have, according to Dall,[3] lost the radula altogether.

DEGRADATION OF THE RADULA.

In certain groups of Marine Gasteropoda, the complete absence of radula has occasioned their classification as 'Gymnoglossa.' The title is unfortunate, because the group as constituted does not include all Gasteropoda destitute of radula. It is perhaps best to regard those instances which occur, as the last terms in a series of gradual degradation, due in many cases to known eccentricities of habitat. Thus no radula occurs in *Eulima*, some species of which are known to be parasitic or commensal on Holothurians, or in *Stilifer* and *Styliferina*, which are parasitic on or in or commensal with Echinoderms and Holothurians. Some of the *Pyramidellidæ* (*Odostomia*) are commensal with *Pecten*.

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[1] Conch. Mittheil., i (ii) 1881, pp. 122—128, pl. 24, f. 5.

[2] Proc. Malac. Soc., v, 1903, pp. 21—30, pl. 2, f. 8.

[3] Bull. Mus. C.Z. Harv., xviii, 1889, pp. 1—492: Smiths. Misc. Coll., 48, 1907, pp. 341—373.

In all these instances, the radula has probably been replaced by something in the nature of a feeding-tube furnished with suctional properties. This is inserted into the slime or tissues of the host, and draws nourishment therefrom; gruel or jelly needs no teeth to bite it, and teeth accordingly have aborted. Doubtless to similar causes is due the absence of radula in *Coralliophila*, which lives exclusively on corals, and in *Magilus*, which becomes imbedded in *Meandrina*, and communicates with the outer world by a long shelly tube.

Other cases occur in which the radula is clearly on its way to profound modification or total disappearance. The whole genus *Columbella* presents a median tooth which is a mere thin plate, destitute of cusps, while the laterals are singularly aberrant. This degradation must date very far back. *Liomesus eburneus* M. Sars has a somewhat similar median tooth, while the laterals are unicuspid. While the other species of the genus, *Pollia*, have normal radula; *P. pagodus* Rve. has only three shapeless masses for median and laterals, the true form of which is seen at the 'nascent end' of the radula, but becomes obscured at the forward part. (In this connexion it would be worth while to look carefully for vestigial 'nascent ends' in the 'Gymnoglossa,' which might furnish evidence of their true relationship). In these last-mentioned cases there is no evidence, whether of habitat or food, to determine the reason of the degradation. Two cases have occurred to me, *Morula spectrum* (Rve.) and *Drupa digitata* (Lam.) in which the radula was not degraded, but profoundly modified as compared with all the other known species of the group.[1] It appeared eventually that both species live only on coral, and, without knowing why coral should produce this curious effect, one may be quite sure that there is some definite cause underlying the radula-change in the other cases cited.

If the conditions of life, the habits, not at one stage of life only, and the food staples of the mollusca are more carefully studied, valuable information bearing on the development and modification of the radula cannot fail to be acquired.

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[1] Cambridge Natural History, vol. iii, p. 222, f. 124: Proc. Malac. Soc., xii, 1917, p. 101.

NOTE ON CONUS LINEATUS Solander AND CONUS LINEATUS Brug.

By A. T. HOPWOOD.

(Read before the Society, April 9th, 1919).

WHILST engaged in a study of the Genus *Conus* it was brought to my notice that two different species, the one recent, the other fossil, each bore the specific title *lineatus*. The original descriptions of the two shells are reproduced below :—

Conus lineatus Solander.

Brand. Foss. Hanton. p. 15, pl. 1, f. 22, 1766.

Conus lineatus :—testa utrinque subconica obsolete striata ; striis æqualibus lævibus spira subnodulosa. Testa magnitudine articuli digiti minimi, utrinque conica, obsolete striata : striis lævibus æqualibus. Spira acuta : anfractibus inferne nodulosis : nodulis æqualibus. Cylindrus seu Venter æqualis sensim attenuatus. Labrum lævc. Columella lævis.

Conus lineatus Bruguière.

Enc. Méth. Vers (2), 645, 1792.

Conus testa conica alba, maculis fuscis longitudinalibus filisque numerosis transversis interruptis, spira obtusa, basi granosa.

It will be seen from these descriptions that the two shells are very different.

Brander's original shell is mislaid, but the fossils now referred to Solander's species agree with his description and figure in every respect excepting only the striæ. The type specimen may have been larger than usual and was probably somewhat worn since it is described as "obsolete striata."

A reference to Bruguière's figure and description can, equally, leave no ground for dispute as to the shell intended.

The fossil shell will retain the specific title *lineatus* Sol., and for the recent species I propose the name *pulchrelineatus*, thus retaining in some measure the name by which it has previously been known. It should be added that the authors of the "Monograph of Eocene Mollusca" published by the Palæontographical Society discerned this discrepancy in 1857 but appear to have done nothing further.

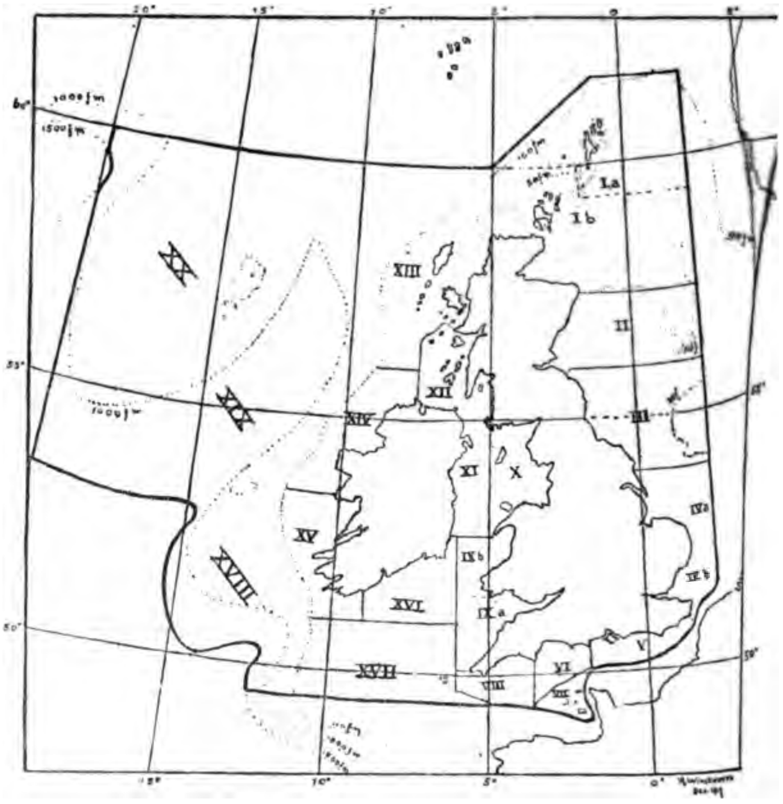
In conclusion I must express my indebtedness to Mr. J. Wilfrid Jackson for placing the *Conchylien Cabinet* at my disposal, and to Mr. R. Bullen Newton, of the British Museum, for his kindness in furnishing me with the extract from Solander's writings quoted above

SCHEME FOR THE DIVISION OF BRITISH MARINE AREA INTO CENSUS AREAS.

By R. WINCKWORTH, M.A., F.R.G.S.

(Read before the Society, June 18th, 1919).

WHILE the land and freshwater mollusca of this country have be intensively studied in a great variety of aspects, there still remains great quantity of work to be done on marine mollusca, all round o coasts. Apart from dredging, even the littoral fauna offers a mul tude of problems to which any of us who live near the sea m contribute valuable data. In my own records I have long used division of the British coastal seas into areas, and recently have attempted to define these areas in detail. The present scheme is tentative only, and probably calls for much revision, especially in Irish waters. Perhaps a Committee might be appointed to examine its practicability and authorize some definite system of Census Areas.



The main object is to get a system which shall really help to represent the British distribution of marine species, and stimulate interest in their study.

Admiralty Chart No. 2—British Isles—is a convenient chart to work on, giving the whole British marine area as far as 15° West, on the average scale of 2½ inches to a degree.

For land and freshwater mollusca, counties and sub-divided counties have been taken as the census unit, but for marine mollusca I believe a far larger area would in most cases be more satisfactory. Even for coastal areas, the county borders do not as a rule divide up the coast suitably; for instance, both sides of an estuary should be in the same area; nor should important centres of biological research, as Liverpool or Plymouth, be on the edge of an area. For littoral and shallow water species, perhaps, these areas may be conveniently subdivided, but too great a subdivision is here also undesirable, so that the coast-line may include suitable habitats for local species; while further search is likely to level up the records of adjacent districts. Thus in East Sussex I have found several species, notably *Acanthochites discrepans* and *Lepton squamosum*, previously recorded only from further west. On the other hand smaller areas give greater value to records from near the border, when tabulated.

Mr. Tomlin, who saw this paper some time ago, strongly recommended separate littoral areas (to include shallow water dredgings), since as a rule the fauna is so distinct and recognizable, while littoral areas would conveniently be much smaller than submarine areas; and it would be a good plan to go round our coasts and designate a number of places as centres of littoral districts. The definition of littoral is difficult; I suggest hesitatingly that waters within five miles of the shore and less than twenty-five fathoms in depth may be taken as an initial definition; but drawing a sharp theoretical line where nature moves gradually is never easy. Perhaps it would be well not to have too cast-iron a limit at first, but to accommodate it to what we already know.

A good boundary line should be 'neutral' for the majority of species, *i.e.*, species found at the boundary should be well distributed into either adjacent area, while a disappearing species should be found only on one side of the boundary. Thus I have taken the southern limit of Yorkshire at 54° N., well south of the chalk cliffs on the shore and of the hard ground further out, and well north of the Humber. The now typical east coast species *Crepidula fornicata* and *Petricola pholadiformis* (both recent introductions from America) are sometimes found on the Yorkshire side of the Humber, but never I think as far north as 54°. At first I used the fifty fathom line as the boundary of coastal and Atlantic waters, inasmuch as it forms approximately the limit of private dredging by hand; but on further consideration I found the hundred fathom line in every way a more suitable limit. Guided by physical features of the sea and coast, and by the known distribution of species, I have for the most part conventionalized the dividing lines into meridians and parallels.

My own experience includes dredging in eleven of the proposed areas, chiefly North Sea and Channel, where I think the limits will prove fairly satisfactory. Area I, the largest, might be again divided by 60° N. west of and 59° 15' N. east of 1° 50' W., thus separating Shetland from Orkney by the Fair Isle Channel, but from my own limited experience the two areas coastally though very different geologically are very similar in species, while the whole Shetland sea as far as the Long Forties seems to be a good single area.

THE WHOLE BRITISH AREA AS DEFINED BY THE CONCHOLOGICAL SOCIETY, SEPTEMBER, 1901.

AREAS.	LIMITS.	SUBAREAS.
SHALLOW SEAS.		
I. Shetland, Orkney, and Scotland N.E.	5°W (Cape Wrath); $57^{\circ}30'$ N (Buchan Ness)	Shetland; Orkney; Scotch coast
II. Scotland, East	NE from Berwick, then 56° N	Aberdeen; Firth of Forth
III. England, North-East..	54° N	Northumberland (Limit 55° = S. Shields); Tees and Yorkshire; Dogger (Limit 20 fm. line).
IV. East Coast	Line, Dover to Griz Nez	Wash and Humber to $52^{\circ}30'$ N; Thames.
V. Channel, Eastern Area	2° W (St. Alban's Head)	East of $0^{\circ}30'$ W; west of $0^{\circ}30'$W
VI. Channel, Middle Area	$3^{\circ}40'$ W (Start Point)..	Weymouth Bay; Lyme Bay
VII. Channel Isles	50fm. line, north of Hurd Deep	
VIII. Channel, Western Area	$5^{\circ}50'$W; parallel of C. Cornwall; 50 fm. line	
IX. Bristol Channel and South Wales	$5^{\circ}50'$W; $52^{\circ}45'$ N (Bardsey)	N. Cornwall; Bristol Channel; Cardigan Bay
X. Liverpool Bay & S. of Man	5° W = approx. 30 fm. line	
XI. Irish Sea	$52^{\circ}45'$N; 5°W; 55°N	
XII. Clyde and Argyll ..	$7^{\circ}25'$W (Malim Head); thence 50 fm. line, round Hawes Bank to Ardnamurchan	Clyde; Argyle; Ulster
XIII. Hebrides and Minch	5° W; 100 fm. line; 56°N	
XIV. Ireland N.W. ..	100 fm. line; $53^{\circ}25'$ N (Slyne Head) ..	
XV. Ireland S.W.	100 fm. line; 51° N; 9° W (Galley Head)	
XVI. Nymphe Bank ..	51°N; $5^{\circ}50'$W	
XVII. Scilly	100 fm. line; 51°; $5^{\circ}50'$ W and 50 fm. line	
DEEP SEAS.		
XVIII. Porcupine Bank .	Inside 1,000 fm., south of 55°N	
XIX. Rockall Deep ..	All waters deeper than 1,000 fm.	
XX. Rockall Bank ..	Inside 1,000 fm., north of 55° N	

In recording it will probably be necessary to notice dead as well as living species, as dead shells are often the only available evidence ; on the other hand records of shells only are often unreliable, and the specimens may be due to ballast or trawl rubbish. Convenient symbols would be + for species recorded living, **I** for species recorded from shells only, and **:** for doubtful records, *e.g.*, a few worn valves or subfossil examples. A good foundation for a census exists in the collections at South Kensington, Liverpool, Edinburgh, and Dublin, in the records of various Biological Associations and in private collections. With these tabulated, we should have a good start, and there would be ample scope for further records.

In the appended table and sketch map I have given the final results of much thought and many attempts.

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Helicodonta obvoluta (Müller) **in Sussex.**—The most easterly record for this species in Sussex seems to have escaped Mr. Beeston's notice in his interesting paper on this species. In a paper on Flint Workings at Cissbury (E. H. Willett, in Proc. Soc. Antiq., vol. xliii, 1879) the shell was recorded from the vallum of this neolithic camp.—R. WINCKWORTH. (*Read before the Society*, May 12th, 1920).

Pyramidula rotundata var. **alba at Brislington, Somerset N.**—Under beech and oak leaves on a decayed tree-stump I took one specimen of *P. rotundata* var. *alba* feeding on a white fungus with type. In the same bank (a red marl soil) I dug out with my stick nine hibernating *Helix nemoralis.* Seven of these were a deep brown colour (var. *castanea*?), the other two normal banded specimens. The brown shells so exactly matched the soil they were buried in, that it looked a good case of protective resemblance.—D. BACCHUS. (*Read before the Society*, March 10th, 1920).

Helix aspersa monstr. **sinistrum near Sittingbourne**—I found a perfect dead specimen of the above monstrosity in my garden on the 23rd October, 1920, with the animal still inside the shell. No doubt it had been killed by a sharp frost two days previously.—H. C. HUGGINS. (*Read before the Society*, Nov. 10th, 1920).

Valvata macrostoma Steenbuch **in West Suffolk.**—In May of this year I found this species in some abundance in a ditch communicating with the Little Ouse, some three-quarters of a mile west of Brandon. The ditch bottom had a thick deposit of vegetable mud in which *Carex paludosa* was growing, and it was on the submerged parts of this plant and on the muddy débris that the *Valvata* was found, whilst several caddis-cases that were collected were composed mainly of living specimens. Associated with it were *Acroloxus lacustris*, *Limnæa pereger*, *L. palustris*, *L. truncatula*, *Planorbis corneus*, *P. umbilicatus*, *P. vortex*, *P. contortus*, *P. fontanus*, *Segmentina nitida*, *Physa fontinalis*, *Bithynia tentaculata*, *B. leachii*, *Vivipara contecta*, *Valvata piscinalis*, *V. cristata*, *Sphærium corneum* and *Pisidium milium*.—CHAS. OLDHAM (*Read before the Society*, Sept. 8th, 1920).

DESCRIPTION OF A NEW GALEOMMA FROM BOMBAY.

By J. R. le B. TOMLIN, M.A.

(Read before the Society, 8th December, 1920).

Galeomma peilei n.sp.

SHELL very similar in general appearance to *G. indecora* Deshayes, which was found by Cuming at Masbate, under stones at low water, but rather larger, longer, and more completely rounded at either extremity, these being practically symmetrical; less sculptured and consequently more shining. The concentric lines of growth are strongly marked in *peilei*, but there is no trace of the strong radiating striæ so noticeable in *indecora* and in the British species *turtoni*, and it is only under a high magnifying power that extremely fine and close scratches, uniform over the whole surface, become visible. The pitting is much less than in *indecora*, being close and strong in the umbonal region, but decreasing in numbers and strength, and finally disappearing a short way from the ventral margin.

Length of type specimen, 13 mm.; height, 6·5 mm.

Habitat: Bombay, under stones at low-water (Lt.-Col. Peile, R.A.).

Type: In British Museum.

Superficially this species has a very similar appearance to our British *Galeomma*, but differs totally from it in sculpture.

DESCRIPTION OF ANTIMITRA (?) HEWITTI n.sp. FROM SOUTH AFRICA.

By J. R. le B. TOMLIN, M.A.

(Read before the Society, 8th December, 1920).

IN the *Journal of Malacology*, xi, p. 31, pl. ii, f. 13, Smith figured this species as *Mitromorpha volva* Sow. var., and gave an excellent diagnosis, and it is curious that he did not describe it as specifically distinct.

The ribs are broader, flatter, further apart than in *volva*, and are more widely spaced on the upper half of the basal whorl than elsewhere; there are four ribs on the penultimate whorl, and sixteen to seventeen on the last, as against five to seven and at least twenty-one respectively in *volva*, and the interstices show distinct axial sculpture, consisting of fine raised lines very close together, with numerous more prominent ones occurring very irregularly. All the ribs on the last three whorls are more or less evidently and regularly spotted with brown. This is particularly noticeable on the peripheral rib, which is broader than the rest and traceable on the two whorls preceding the body one.

Length, 7 mm.; diam. max., 2·75 mm.

Habitat: Port Alfred, not uncommon, East London.

Type: In my own collection.

Named in honour of the able Director of the Albany Museum.

The correct usage of the generic name *Mitromorpha* is pointed out in Proceedings of the Malacological Society of London, vol. xii, p. 328, and it is at present uncertain where these South African forms should be placed.

◆

Giant Race of Cardium edule L.—While in Orkney in 1917, I came across a giant race of cockles at Congesquoy, near Stromness. Except that they are considerably larger in size, they correspond to *Cardium edule* var. *major* B.D.D. (Mollusques Marins du Roussillon, ii, 292, and plate 46, fig. 6). The adults mostly range from 53 to 66 mm. in breadth, and average about 60 mm.; but I obtained three monsters outside this size even; my largest measures 76 × 64 mm., and 51 mm. in thickness; it weighed 5 ounces living; the shell approximately 3 ounces, and containing about 1 ounce water and 1 ounce body. All the cockles in these sands are of the same type, and the smaller specimens are perhaps even more striking, shells up to 53 mm. showing signs of immaturity. One day we took 270 live cockles, weighing 28 lbs., and feasted royally on them. The animal does not appear to differ from typical *Cardium edule*. All the features of the shell are emphasized in proportion to its size and solidity, the ventral margin tends to be straighter than in the type, and the ribs more numerous (27 to 30). Their habitat is clean sand, and the water is clean and presumably somewhat fresh, as it is just below the outfall of the Loch of Stenness. Associated with *Cardium edule* are *Venus gallina* var. *laminosa*, *Spisula subtruncata* var. *striata*, *Tellina tenuis*, and *Mya arenaria*, and lower down *Ensis siliqua*—all well developed in size, but none gigantic.—R. WINCKWORTH (*Read before the Society*, December 10th, 1919).

Milax gagates in Gloucester West.—On September 5th, 1920, under some pieces of cardboard lying on a pathway at Redland, Bristol, I found some half-dozen of the above slug. I believe it has not been taken in this vice-county before. Mr. J. W. Taylor, who kindly identified them for me, informs me they were not fully grown, and still showed the pale keel said to be characteristic of the juvenile stage. If retained to the adult, they would be referable to the var. *benoiti*. The roadway is only about one hundred yards long, a high garden wall on one side, and on the other an open field. On the stone-coping of the pathway, which is grass-covered, I also took *V. pulchella*, *V. costata*, *Vertigo pygmæa* (in numbers), and a couple of *Punctum pygmæum*.—D. BACCHUS. (*Read before the Society*, Nov. 10th, 1920).

PISIDIUM PARVULUM Clessin IN THE GREAT OUSE AND THE SEVERN.

By C. OLDHAM.

(Read before the Society, October 12th, 1918).

In some material collected in the Great Ouse at Newport Pagnell, Bucks., in August last I found several dead shells of *P. parvulum* associated with *amnicum*, *casertanum*, *subtruncatum*, *supinum*, *henslowanum* and *nitidum*, a typical river assemblage; and at Bromham, Beds., some 35 miles further down the stream I collected other dead shells of *parvulum* and one living specimen. The associated species here were the same as at Newport Pagnell, but with *milium* and *hibernicum* (a single specimen) in addition. In the river bank near Bromhall mill, about three feet below the present level of the meadows a band of shell-marl of Holocene age is exposed, which is rich in mollusca. I detected forty-one species of land and fresh-water shells, and washed out a considerable number of valves of *parvulum* and *supinum*. The associated Pisidia were the same species that were living in association in the river, except *hibernicum*, and included in addition *personatum*. The last named had probably not been associated with the others in life, but had been swept down stream with the heterogeneous collection, which included terrestrial species, such as *Vertigo pygmæa*, *Carychium minimum*, *Cochlicopa lubrica*, *Vallonia excentrica* and *Hygromia hispida*, until it came to rest in the slack water at the place where the deposit was being formed.

During September I was in Worcestershire and collected some Pisidia in the Severn. I failed to find *parvulum* at Bewdley, although *supinum*, with which it is so often associated, was common there; but at Stourport I took a single living specimen, the associated species being the same as in the Ouse at Newport Pagnell, and, incidentally, the same as I have found in many places in the Grand Junction Canal in Bucks. and Herts., i.e., *amnicum*, *casertanum*, *subtruncatum*, *supinum*, *henslowanum* and *nitidum*. A gathering made in the City of Worcester included half-a-dozen living *parvulum*, the associated species being the same as at Stourport and Newport Pagnell, with the omission of *nitidum*.

P. parvulum has presumably been a member of our fauna since Pleistocene times; it is abundant in the brick-earth of that age in the Thames valley, and indeed outnumbered all the other Pisidia together in some material I obtained at Crayford, Kent, a year or two ago. Its occurrence in a living state in the Ouse and Severn and the stations already known for it in the river systems of the Thames and Shannon suggest that it has a wide range in Britain, and that it has only been overlooked so long because of its minute proportions, for it is a very distinct and well marked form.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

494th Meeting, held at the Manchester Museum, September 8th, 1920.

Mr. R. Standen in the chair.

New Members Elected.

Colonel Frederick Sprate Bowring. Ellis Crapper.

Candidates Proposed for Membership.

Richard Bulley, 10, Stratford Square, Nottingham (introduced by W. Gyngell and E. R. Brown).

Berthold Sundler, Borås, Sweden (introduced by Hans Schlesch and J. H. Matthews).

C. A. Stepney Barnacle, Ruanwella Estate, Ceylon (introduced by Rev. Dr. A. H. Cooke and R. Standen).

Norman William Sier, 2, Willow Lane, Norwich (introduced by A. Mayfield and R. Standen).

Papers Read.

"Land and Freshwater Mollusca of Winsley, North Wilts.," by D. Bacchus.

"*Valvata macrostoma* Steenbuch in West Suffolk," by C. Oldham.

"*Pisidium parvulum* Clessin in Cheshire," by C. Oldham.

"Variation of *Ena obscura* (Müller)," by W. E. Alkins.

Principal Exhibits.

By Mr. C. Oldham :—Large *Limax maximus* (alive) from a beech wood, Streatley, Berks. ; *Valvata macrostoma*, Brandon, Suffolk W. ; *Pisidium parvulum* and *P. supinum* from canal, Beeston Castle, Cheshire ; *Pisidium supinum* and *P. amnicum* from River Dee, Eccleston Ferry ; *Limnæa pereger* var. *lacustris* and *Ancylus fluviatilis*, Coniston Water, Lake Lancashire ; *Margaritana margaritifer*, River Irt, Holmrook.

By Mr. A. K. Lawson :—*Margaritana margaritifer* from River Tay, Perth, with pearls and photographs of habitat.

By Mr. E. Crapper :—Exceptionally fine pearl-mussel and pearls from River Tay, Perth.

By Mr. L. E. Adams :—Large *Planorbis corneus* from Reigate.

By Mr. J. H. Matthews :—Large *Planorbis corneus* from Sale ; *Volutopsis norvegicus* from 95 fathoms, Cape Langanaes, Iceland ; *Saxicava arctica* (from sponges) and *Crenella lævigata* (from cod), 100 fathoms, North Cape, Iceland.

By Mr. R. Standen :—Shell and egg of *Ennea* (*Uniplicaria*) *microdon* from Mayotte.

By Mr. G. C. Spence :—*Plicaxis mirabilis* (Sykes) from Kelantan.

By Mr. A. T. Hopwood :—*Helix aspersa* var. *exalbida* from St. Lawrence, Thanet.

By Mrs. Gill :—*Cypræa aurantia* and *C. thersites*.

By Mr. E. R. Brown :—Unusual *Cypræa ziczac* ; fine *C. erythræensis*.

495th (Annual) Meeting held in the Linnean Society's Rooms, Burlington House, London, W.1, Oct. 16th, 1920.

The President (the Rev. Dr. A. H. Cooke) in the chair.

Among those present were the following :—Messrs. J. C. Dacie, A. J. Saban, H. E. J. Biggs, G. C. Spence, J. E. Cooper, H. W. Worsfold, H. McClelland, J. R. le B. Tomlin, A. S. Kennard, L. E. Adams, H. C. Fulton, A. E. Salisbury, C. Oldham, E. A. Bacon, R. Winckworth, F. B. Jennings, Rev. E. W. Bowell, Mr. and Mrs. H. C. Huggins, Mr. and Mrs. H. Overton, Major M. Connolly, Dr. A. E. Boycott, Dr. W. T. Elliott, and Mr. J. W. Jackson.

Appointment of Auditors.

Messrs. C. H. Moore and E. R. Brown were re-appointed Auditors.

Appointment of Scrutineers.

Messrs. A. S. Kennard and J. E. Cooper were appointed Scrutineers.

Appointment of Trustee.

Mr. J. R. le B. Tomlin was appointed Trustee in place of Edward Collier (deceased).

Election of Honorary Members.

The Marquis of Monterosato, of Palermo, and Mr. Henry Crowther, F.R.M.S., of Leeds (one of the Founders of the Society) were elected Honorary Members.

New Members Elected.

Richard Bulley. Berthold Sundler. C. A. Stepney Barnacle. Norman William Sier.

Resignation.

Miss Mary Dixon.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1920—21 as nominated by the Council had been unanimously elected (*see page* 133).

Presidential Address.

The Rev. Dr. A. H. Cooke gave his address on "Evolution in the Molluscan Radula."

A cordial vote of thanks was passed to the retiring President for his services. Votes of thanks were also accorded to the Council of the Linnean Society and to their Secretary, Dr. B. Daydon Jackson, for kind permission to hold the Annual Meeting in their rooms; to the authorities of the Manchester Museum for continued permission to hold the monthly meetings on their premises; and to the Officers and Council of the Society for their past services.

Exhibits.

By Mr. H. Overton: *Helix hortensis* and varieties from Lode Hill, Downton, Wilts.; *H. lapicida* var. *minor*, West Porlock, Somerset; *H. itala* (small) from Bow Hill Tumuli, Kingly Vale, near Chichester; *Ena montana* var. *albina*, Sheepscombe, near Painswick, Glos.; *Tapes virgineus* var. *veneroides* Tye, from St. Peter's Port, Guernsey (ex coll. G. S. Tye).

By Mr. A. J. Saban: *Helix nemoralis*, *H. hortensis*, *H. pomatia*, and *H. limbata* from France and Germany; *H. hortensis* var. *roseozonata*, Farnboro', Kent.

By Mr. J. C. Dacie: British *Littorinæ*, *Nucella lapillus*, from Hastings and Fairlight; *Hygromia umbrosa* from Margate and Westgate, Kent.

By Mr. A. E. Salisbury: Series of *H. hortensis* showing influence of food on colouration of shell.

By the Rev. Dr. A. H. Cooke: The *Alopia* group of *Clausilia* (peculiar to Transylvania and Western Roumania); photomicrographs of *Clausilia* radulæ in illustration of his address.

By Mr. H. McClelland: Specimens collected in Jeffreys Bay, South Africa; *Cymatium dolarium* Lk. and its mature form, *africanum* A.Ad., showing great variation in the species, and curious abrupt change in sculpture during progress of growth.

By Mr. L. E. Adams: Feeding tracks of *Helix aspersa* on lime-distemper of window; also actual size photograph of a portion of track taken direct through the glass; *Planorbis corneus* Kingsmead, Surrey.

By Mr. H. W. Worsfold: *Pteropoda* and *Sphærospira.*

By Mr. H. Watson: Abnormal radula of *Helix nemoralis.*

By Mr. A. T. Hopwood: Rare species of *Conus*, including *C. chytreus* Melv., *C. archithalassus* Dillw., *C. lienardi* Cr., *C. rhododendron* Couth., and *C. crocatus* Lk.

By Mr. J. W. Jackson: Locality sets of *Paludestrina jenkinsi.*

By Mr. H. C. Huggins: Non-marine mollusca from many Irish localities; *Helix hortensis* var. *arenicola* (12345), Sittingbourne, Kent; *Limax cinereo-niger*, Hucking, Kent.

By Mr. J. E. Cooper: Dr. Gwyn Jeffreys' copies of Draparnaud's "Histoire" and Wood's "Index," with his autograph; two hitherto unrecorded specimens of *Conus chytreus* Melv.; series of *Limnæa stagnalis* from a gravel-pit near Yiewsley, to illustrate the great variation in size and form in different years; series of *H. virgata* from the Middlesex "record" locality (east of Yiewsley) including var. *radiata*; two boxes of caddis-cases bearing about thirty-two species of shells; forty-six species of British non-marines as examples of albinism; sections of shells.

By Mr. J. R. le B. Tomlin: Some rare *Trochidæ*, including *Basilissa babelica* Dall from 600 f. off Yokohama, *Turcica imperialis* A.Ad., *T. monilifera* A.Ad., *T. chinensis* Sow., *Eutrochus javanicus* Lk. and *Turcicula bairdii* Dall; *Cypræa peasei* Sow., *C. rashleighana* Melv., *C. mappa* var. *montrouzieri* Dautz., and *C. arabica* var. *nigra* Roberts; a complete series of British Chitons; *H. pisana* var. *diaphana* Bourg., *Galeomma turtoni* Sow., *Planorbis leucostoma*, *Limnæa glabra*, and others from Guernsey.

By Mr. G. C. Spence: *Ceras manyemaense* D. & P.; *Obeliscus cuneus* Pfr. and *O. riparius* Pfr., with embryos.

By Mr. F. B. Jennings: Autograph of Rev. Revett Sheppard.

ANNUAL REPORT.

The present is the Forty-Fourth Annual Report of the Society. Since the last Annual Meeting we have lost five members by death, and nine by resignation, making a total loss of fourteen. The new members amount to fourteen (including four elected at this meeting). The membership of the Society (including ten Honorary Members—two elected at this meeting) is 290, as at the last Annual Meeting.

The Society has to deplore the death of Thos. Hey, a member for thirty-three years, a celebrated mycologist, and the author of a paper on the mollusca of Derbyshire; M. M. Schepman, of Utrecht; F. E. Adams; H. C. Napier; and Edward Collier, last year's President and one of our earliest members. Mr.

Collier was an enthusiastic worker and a specialist in many groups of land mollusca. It is hoped to publish an Obituary Notice in the next issue of the *Journal.*

The usual monthly meetings have been held at the Manchester Museum, by kind permission of the authorities, and the attendance has been well maintained. Some twenty-three notes and papers have been read, and the following Special Exhibits have been held :—*Physa* ; British *Cardium* ; *Helix pisana* ; *Ampelita* ; Abnormal Shells ; *Achatinella* : and *Leptoconus.*

During the year two numbers of the *Journal* (vol. 16, no. 3, January, 1920 ; and no. 4, August, 1920) have been published, consisting of sixty-four pages of text (including List of Members), one plate, and four text-figures. The drawings and blocks for the illustrations were furnished by J. R. le B. Tomlin, G. C. Spence and A. T. Hopwood.

The Council regrets its inability at present to publish more than two numbers of the *Journal* per annum owing to the continued high cost of production. In order to issue the usual four numbers it would be necessary to increase the annual subscription to at least one guinea.

The Library has received several additions, the chief donors being the late Mr. E. Collier, Drs. H. A. Pilsbry, W. H. Dall, P. Bartsch, J. C. Melvill, A. E. Boycott, W. M. Tattersall, Rev. Dr. A. H. Cooke, Messrs. H. Watson, J. A. Grieg, J. W. Jackson, A. T. Hopwood, H. Schlesch, A. S. Kennard, B. B. Woodward, N. H. Odhner, C. Hedley, R. W. Bretnall, J. B. Henderson, and the Trustees of the British Museum (Natural History).

The donations to the Cabinet have been few, mainly from Mr. C. Oldham and Mr. R. Winckworth.

The Society is also indebted to Dr. J. C. Melvill for a handsome portrait of Lovell Reeve.

RECORDER'S REPORT.

A FAIR number of fresh records has been added to the Census. The re-examination of the whole of Mr. Roebuck's data has been completed and the results are in preparation for publication. Sufficient funds have now been obtained to justify the printing of a new Census ; further donations would, however, be welcome.

ANNUAL REPORT OF THE LEEDS BRANCH.

ELEVEN meetings have been held during the year—five in the field and six winter meetings. A paper was given by Mr. F. Booth on the "Uses of Mollusca to Man." Two short papers were given : one by Mr. H. L. Stephenson on "Some Difficulties to be met by the Collector of Marine Species" ; and a second by Mr. G. Fysher "On a Conchological Cycling Tour in Ireland." Two Special Exhibits were held—one of reversed shells, and the other of edible mollusca.

The winter meetings were well attended, but railway difficulties still interfere with summer rambles.

Mr. J. E. Crowther is our President. F. BOOTH, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

TEN evening meetings and two field excursions were held. The evening meetings were well attended, and the exhibits of both foreign and British species extensive and interesting.

The branch was again indebted to Mr. A. S. Kennard, this season's President, for his valuable notes on British non-marine species, and for his continuing discourse on the early British conchologists.

The branch has sustained a loss in the resignation by Mr. J. E. Cooper of the Hon. Secretaryship owing to business pressure. He has filled the post with unvarying success for the last twenty-six years.

J. C. DACIE, *Hon. Sec.*

REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

OWING to distance it is difficult to get a large attendance at meetings. However, on November 8th, 1919, four members met at Oakamoor, and under the leadership of Mr. W. E. Alkins made an excursion through Oakamoor, Three Lows, North Wood, and Ramsor Limestone Quarry. Twenty-five species of mollusca were obtained, including *B. perversa*, *L. glabra*, *S. lacustre* (large), *H. caperata*, *H. fusca*, and *E. obscura*. During the year, although no new species has been found, one new variety has been recorded, viz. :—*Z. nitidus* var. *viridescens*. The honour of this "find" fell to the lot of Mr. Alkins (*J. of Conch.*, vol. xvi, p. 52), but further specimens have since been taken by others. New localities have also been recorded for some species.

B. BRYAN, *Hon. Sec.*

496th Meeting, held at the Manchester Museum, Nov. 10th, 1920.

Mr. R. Standen in the chair.

Papers Read.

"*Helix aspersa* var. *exalbida* at Westbury-on-Trym," by D. Bacchus.
"*Milax gagates* in Gloucestershire West," by D. Bacchus.
"*Polita rogersi* in Leigh Woods, Somersetshire North," by D. Bacchus.
"*Limax tenellus* Müll. in Wales," by H. Watson, M.A.
"Notes on Kentish Mollusca," by Canon J. W. Horsley.
"*Limax cinereo-niger* in Kent," by H. C. Huggins.
"*Helix aspersa* m. *sinistrum* near Sittingbourne," by H. C. Huggins.
"*Helix hortensis* var. *arenicola* near Sittingbourne," by H. C. Huggins.

Principal Exhibits.

By Mr. J. W. Jackson: *Ancylus fluviatilis* var. *albida-gibbosa* from Dove Dale (Staffordshire side) opposite Dove Holes, associated with *L. pereger* and the water flea, *Gammarus pulex*.

By Mr. R. Harrison: *A. cygnæa* from Whitworth Park Lake, Manchester.

By Mr. A. K. Lawson: *A. cygnæa* from Dupplin Loch, Perthshire.

By Mr. J. R. Hardy: *Testacella haliotidea* (living) from fields off Barlow Moor Road, Chorlton-cum-Hardy.

By Mr. J. K. Taylor: Band variations of *Helix nemoralis* (163 forms), and *H. hortensis* (74 forms).

By Mr. G. C. Spence: Species of *Corilla*.

By Mr. A. T. Hopwood : *Conus panniculus* and vars., *C. patens*, *C. virgatus*, and *C. aplustre*.

By Mr. R. Standen : *Cypræa umbilicata* and *C. platypiga* M'Coy (fossil from Muddy Creek, Victoria); *C. pulchella* and var. *pericalles* ; *C. arabica* (young form = *amethystea*).

By Mr. A. J. E. Cave : *Cypræa mus* from Venezuela.

By Mrs. Gill : *Cypræa tigris* (young stages and varieties) ; *C. lurida* from Sicily and Ascension Island.

It was decided to have the following Special Exhibits :—

December 8th	Slugs and their shells.
January 5th	*Cochlitoma.*
February 2nd	*Rostellaria.*

497th Meeting, held at the Manchester Museum, Dec. 8th, 1920.

Mr. R. Standen in the chair.

Resignations.

Edward A. Bacon. A. Bavay.

Members Struck Off the List (Rule IV).

Julius Heller. Mrs. G. Norwood. A. Reynell. J. M. M. Williams.

Papers Read.

"*Pisidium tenuilineatum* in the Thames," by C. Oldham.

"*Pisidium lilljeborgii* in Montgomeryshire," by C. Oldham.

"*Limax tenellus* in Gloucester West, Hereford, and Montgomery," by C. Oldham.

"Description of a New *Galeomma* from Bombay," by J. R. le B. Tomlin, M.A.

"Description of *Antimitra hewitti* n.sp. from South Africa," by J. R. le B. Tomlin, M.A.

Principal Exhibits.

By Mr. A. K. Lawson : *Helix hortensis* (small forms), Arbroath ; *H. aspersa* (small, thin forms—probably introduced), Newport, Fife.

By Mr. A. T. Hopwood : Small pearls from *Anodonta cygnea*.

By Mr. G. C. Spence : *Urocoptis amethystina*, Chitty, Jamaica (e coll. Lombe Taylor) ; *Brachypodella* (*Libarotes*) *suturalis* Weinland, Haiti.

By Mr. J. W. Jackson : *Limnæa pereger*, *Planorbis fontanus*, and *Pl. crista*, taken recently with the freshwater Isopod, *Asellus aquaticus*, in a pond at Alderley Edge.

In the Special Exhibit, "Slugs and Their Shells," series were shown by Messrs. Standen, Jackson, Oldham, Harrison, Hardy, Mrs. Gill, and the Manchester Museum.

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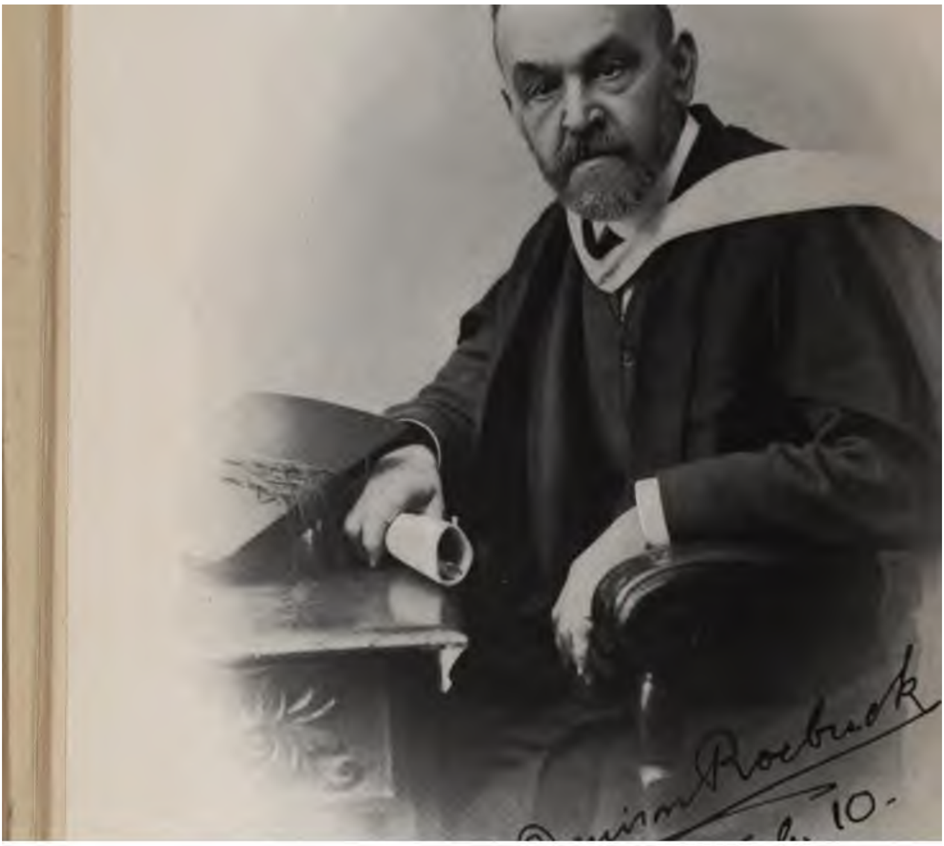

Denison Roebuck

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THE

JOURNAL OF CONCHOLOGY.

Vol. 16. JUNE, 1921. No. 6.

CENSUS OF THE DISTRIBUTION OF BRITISH LAND AND FRESHWATER MOLLUSCA.

By the late W. DENISON ROEBUCK.

Introduction.

From the printed records of the Society it is not very clear when Roebuck began a systematic record of the distribution of British land and freshwater mollusca, but he used to reckon himself (e.g. *Journal*, i, p. 220; vi, 314) that the census began in 1877, and the first entry in the books was made on 25th October, 1876. They show plenty of fresh entries up to the end of 1918, so that the data summarized here are the product of forty-two years' work. For the first three years or so the project was practically confined to Yorkshire, but at the sixty-fifth meeting of the Society, held in Leeds in the early part of 1881, Roebuck read a paper (*Journal*, iii, p. 138) on a "proposed system of conchological locality records," in which he advocated that "the Conchological Society should commence a system of recording the localities of British mollusca," it being "an indispensable requirement that every record be accompanied by a voucher specimen," and H. C. Watson's arrangement of county areas being used—the whole in imitation of the methods of the Botanical Record Club. The plan was presumably approved by the Society, for at the annual meeting in December, 1882, Roebuck was definitely appointed "Recorder of the Conchological Society," and a year later reported that 2,965 records had been added during the year, bringing the total to 5,636. Progress was annually reported each year till 1891, when a total of 31,405 for fourteen years' work is noted (*Journal*, vii, p. 16). Roebuck continued to be official recorder till 1895, when E. Collier succeeded him, to be replaced the following year by T. Rogers for four years, followed by L. E. Adams (1900–1903), C. Oldham (1903–1906), and F. Taylor (1907–1910); in 1911 Roebuck resumed the appointment, and continued

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in it till his death in 1919. From the commencement of the census scheme, Roebuck worked in close co-operation with J. W. Taylor, in preparation for the latter's *Monograph*, and in 1908 (*Journal*, xii, p. 255) started a fresh and effective campaign for acceleration, in conjunction with the official recorder of the Society. It is in no way derogatory to the work of the other recorders—and if it were it would remain the plain fact—to remark that the great bulk of the twenty-nine record books is in Roebuck's handwriting. At the end of 1918 or thereabouts he reckons on a slip of paper that the total number of records is 59,432, and no one will complain if in common talk the results come to be known as "Roebuck's Census." It would hardly be possible to give a list of those, young and old, who have in a variety of ways helped in the work, some with spontaneous enthusiasm, others with that interest and activity which Roebuck's pertinacity could arouse so well. A few workers have refused their co-operation, out of shyness at having their identifications critically revised, or because they did not care for the personality of the referees, or because they loved their specimens too well, or from simple lack of interest or some of the other natural emotions which lead men to curious actions. Though the number of these is small, it is perhaps hardly worth while to catalogue their names; they have at any rate deprived themselves of any right to criticise the census for deficiencies which in a better mind they could have themselves remedied.

The printed versions of the census appear to have been :—

(1) by J. W. Taylor and W. D. Roebuck, communicated to the Society on 16th April, 1885, and printed in the *Journal*, vol. iv, p. 319.

(2) a revised version of the same, on pp. 94–112 of *Land and Freshwater Shells*, by J. W. Williams; first edition, 1889, and, again brought up-to-date, in the third edition, 1901.

(3) by W. D. Roebuck, on pp. 182–209 of *The Collector's Manual of British Land and Freshwater Shells*, by L. E. Adams: second edition, 1896.

(4) by L. E. Adams, communicated to the Society on 11th June, 1902, and printed in the *Journal*, vol. x, p. 217, with a map.

(5) the records for Scotland, by W. D. Roebuck. *Proc. Roy. Phys. Soc. Edin.*, vol. x (1890), pp. 437–501 in detail, and for Easterness (*Scottish Naturalist*, 1916, p. 107), for Argyll (*ib.* p. 229), for Wigtown (*ib.* p. 253), for Kirkcudbright (*ib.* 1917, p. 7), and for Elgin (*ib.* p. 79).

In 1911 the Council reported that the publication of a new version was under consideration, and in 1916 resolved that it could not be further delayed. In 1917 a special fund to provide for publication was successfully inaugurated, and Roebuck began a revision of the records, but for various reasons no further progress could be made. On 15th February, 1919, Roebuck died, leaving his books and papers in such good order that the reduction of his data to their present form has not been difficult, though lack of familiarity with his plans has unduly delayed, and doubtless maimed, their presentation. In accordance with his intention, the whole of the records from the beginning have been examined and re-catalogued for this edition, which is therefore something more than the version of 1902 brought up-to-date.

The census *consists entirely of records based on actual specimens of snails and slugs which have been seen and identified by the Society's referees ; no records have been admitted unless voucher specimens have been authenticated in this way*. The uniformity of truth—or error as the case may be—is thus considerable. But it is not absolute ; it could not have been in any human scheme and the records are not all of equal validity. In the great majority of cases the specimens have been submitted to the referees through the recorder by the actual collectors, mostly at the time. In other cases they have reached him through collections, public or private, and among these is a certain number of museum records which are less satisfactory. It has been difficult to decide in some cases whether museum specimens should be regarded as good records or not: generally speaking importance has been attached to the presence or absence of details of locality and collector, to prima facie probability and to collateral evidence. Thus "*Pupa cylindracea*, Caerlaverock Castle, Dumfriesshire ; R. Rimmer, 6th Sept., 1889," in the Edinburgh Museum raises no reasonable doubts. *Ena montana* in the Alder Collection at Newcastle labelled "Whipstead, Suffolk," would be suspicious were it not known (*Journal*, xi, 337) that the species has been collected in more than one place in West Suffolk. Contrariwise, a specimen in the Parfitt Collection at Exeter, labelled "Plymouth" is not reckoned as a valid record in the absence of any other evidence that the species has occurred in such an unlikely neighbourhood. Nor can *Clausilia cravenensis* from "Suffolk" in the National Museum of Wales be regarded as satisfactory. These museum records form a very small proportion of the whole and in view of these considerations they have been catalogued separately and when they are of importance they are specially noted. In the same way improbable and ill-defined localities attached to specimens in private collections have been regarded as suspicious in the absence of some extraneous confirmation ; where possible they have been referred to the original collectors. In these ways therefore we get two categories of records, those which seem satisfactory and those which "require confirmation"; the latter are printed in italics in the table and often mentioned in the notes.

All the older records of the smaller species of ***Pisidium*** (*i.e.* all except ***amnicum***) are arranged under the five Jeffreysian species; since 1913 a certain number have been identified according to the classification of B. B. Woodward. All these have been discarded and replaced by fresh records for which R. A. Phillips and A. W. Stelfox have since 1918 acted jointly as referees on behalf of the Society. Indications for fitting their nomenclature on to previous systems will be found in the *Journal*, xv, 235, 260, 289.

There has been no systematic attempt to collect holocene records. Incidentally a fair number have been included which are mentioned in the notes when they appear to be of interest, but not in the table of distribution.

The list contains 163 species, 157 of which have been authenticated for England, 127 for Wales, 115 for Scotland, and 126 for Ireland.

COMITAL AND VICE-COMITAL AREAS.

The areas adopted or the Census were those devised about 1845 by H. C. Watson (*Cybele Britannica*, iv, (1859) 139 ff.) for England, Wales and Scotland, and about 1858 by C. C. Babington (see *Irish Nat.* v, 29) for Ireland. These corresponded to counties as they then existed, except that the larger counties were sub-divided, some of the smaller united with a neighbour and all detached portions included in the county by which they were surrounded. The political boundaries have in some cases since been altered so that reference to old maps may be necessary; Watson used one published by the Useful Knowledge Society. Since the last edition of the Census the Irish areas have been arranged so as to correspond with those used by R. L. Praeger (*Proc. Roy. Irish Acad.* (3) vii (1901)) and shown on his map. There is unfortunately no corresponding map for the rest of the British Isles. As may be imagined, the precise definition of dividing lines is a large question, involving a great mass of topographical detail. Roebuck gave considerable attention to it and was preparing to treat it on an ample scale. Here we can reproduce only a short summary of the deviations of the boundaries of areas from those of counties.

1-2: **Cornwall W. and E.**; road rom Truro through Ladock to St. Columb and Wadebridge. 3-4: **Devon N. and S.**; along the watershed from the Tamar at Leigh Barton, about midway between Tavistock and Launceston, over the ridge of Dartmoor by Cawsand Beacon, Spreyton, Morchard Bishop, Puddington, Templeton to Tiverton and thence along Grand Western Canal to county boundary. 5-6: **Somerset N. and S.**; rivers Parrett and Yeo to county boundary at Mudford. 7-8: **Wiltshire N. and S.**; Kennet and Avon Canal. 11-12: **Hants. N. and S.**; high roads from Winchester westwards through Stockbridge and eastwards through Chilcombe and Petersfield to boundary on Rogate road. 13-14: **Sussex E. and W.**; high road from Brighton by Hassocks Station to Cuckfield and Crawley to Surrey boundary. 15-16: **Kent E. and W.**; rivers Medway and Beult to Maidstone—Goudhurst road, then along main road Staplehurst, Cranbrook, Hawkhurst to boundary. **18-19: Essex N. and S.**; main road from Waltham Abbey through Epping, High Ongar, Writtle to Chelmsford, thence along Chelmer and Blackwater Canal to the sea. **25-26: Suffolk E. and W.** and **27-28: Norfolk E. and W.**; both divided by the parallel of longitude 1 degree east of Greenwich. **33-34: Gloucester E. and W.**; Thames and Severn and Stroudwater Canals from Cerney to Severn at Framilode, thence up Severn to Deerhurst. **49-50: Denbigh** includes the parts of Carnarvon east of river Conway. **53-54: Lincoln N. and S.**; river Witham to Lincoln and Foss Dyke to Notts border at Drinsey Nook. **55: Leicester** includes **Rutland. 59-60: Lancashire S. and W.**; river Ribble to Yorks. border; Lancashire north and west of Morecambe Bay goes with **Westmorland. 61: Yorks. S.E.** is the East Riding. **62-65: Yorks. N.E. and N.W.**; southernmost bend of Tees to nearest bend of Wiske, thence down Wiske and Swale to junction with Ure. **63-64: Yorks. S.W. and M.W.**; Leeds and Liverpool Canal Foulbridge to Leeds and canalised Aire from Leeds to Ouse. **65: Yorks. N.W.** is the North Riding west of the Wiske and Swale *plus* that part of the West Riding north of the Lune-Ribble watershed from Gragreth over Whernside to near Newby Head. **67-68: Northumberland S. and N.** (or **Cheviotland**); river Coquet to Linn Bridge, thence watershed by Crigdon Ridlees and Golden Pot to Grindstone Law. **85: Fife** includes **Kinross. 87-88: Perth S. with Clackmannan and Perth M.**; Tay-Forth watershed. **88-89: Perth M. and N.**; rivers Garry and Tay. **92-93: Aberdeen N. and S.**; watershed east and west from Inverary. **95: Elgin** roughly equivalent to the present administrative county (details in *Scottish Nat.*, 1917, 79). **96-97: Easterness and Westerness**; Inverness is divided by the watershed between east and west of Scotland, continued along Loch Erricht to Perth border; the eastern part with **Nairnshire** is Easterness, the western with the part of Argyll north-west of L. Linnhe is Westerness. **98: Argyll** is the county without Cantire, the islands and the part north-west of L. Linnhe. **100: Clyde Islands**; Bute. Arran, Cumbrae, etc. **101: Cantire** separated from Argyll by Crinan Canal. **102: Ebudes South**; Jura, Colonsay, Islay, etc. **103: Ebudes Mid.**; Mull, Coll, Staffa, etc. **104: Ebudes North**; Skye, Rum, Muck, etc. **105-106: Ross E. and W.**; watershed between east and west coasts. **107-108: Sutherland E. and W.**; watershed between north-west and east coasts. **119 W.—119 E.: Donegal W. and E.**; Lough Swilly to Donegal Bay, the baronies of Tirhugh, Raphoe and Inishowen, with Londonderry City, forming Donegal E. **137-138: Mayo E. and W.**; Lough Mask and river Ayle, then to Castlebar and down river Moy to sea. **139-140 N.: Galway W. and N.E.**; Lough Corrib and River Corrib. **140 N.-140 S.: Galway N.E. and S.E.**; railway Ballinasloe to Oranmore. **143-144: Tipperary N. and S.**; G.S.W. railway Maryborough to Charleville. **146 E. and 146 M.: Cork E. and M.**; railway Charleville to Cork and by western shore of Cork harbour to sea. **146 M.-147: Cork M. and W. (or S.)**; Killarney Junction Railway from Kerry to Millstreet, thence in straight lines to Macroom and Bandon and by river to sea. **148 N.-148 S.: Kerry N. and S.**; boundaries of baronies of Magunihy and Trughanacmy.

There are in all 153 areas; 60 in England, 12 in Wales, 41 in Scotland and 40 in Ireland. The number in which each species occurs is shown in the summary.

SUMMARY AND NOTES.

Testacella maugei. 23. Gardens, Middlesex and Cornwall to Chester, mostly south-western ; south-east Ireland.

T. haliotidea. 42. Gardens from Lanark southwards : mid and south Ireland.

T. scutulum. 46. Gardens, Kent and Somerset to Perth ; diffused in Ireland.

Limax maximus. 144. Gardens, cultivated land, and wild places generally.

L. cinereoniger. 64. General in old woods and hedges ; not common.

L. tenellus. 23. Rare : in autumn in ancient woods, Kent and Devon to Inverness ; not in Ireland.

L. flavus. 98. Domestic in houses and gardens, rarely wild, north to Caithness : not common in Scotland ; general in Ireland.

L. arborum (*marginatus*). 137. General in woods, mountains, moors, cliffs etc.

Agriolimax (*Limax*) **agrestis.** 153. General in gardens, fields and most habitats.

A. lævis. 105. In wet places generally.

Milax (*Amalia*) **sowerbyi** (*marginatus*). 94. North to Aberdeen, especially in gardens : not common in Scotland.

M. gagates. 87. Not so common as *sowerbyi* ; north to Orkney.

Vitrina pellucida. 148. General in autumn and winter.

V. pyrenaica (*hibernica*). 2. Louth and Meath in Ireland (*Irish Nat.*, xvi, 225 ; xvii, 94 : xviii, 204 : xxiii, 205): a Pyrenean species.

Hyalinia (*Zonites, Vitrea, Polita*) **lucida** (*draparnaldi*). 56. Mostly in gardens and cultivated ground north to Hebrides : wild in south-west.

Hy. rogersi (*helvetica, glabra*). 68. Shaded places north to Banff ; uncommon in Scotland. Irish workers think that it does not occur in Ireland, and that a highly polished form of *cellaria* has been mistaken for it (*Irish Nat.*, xix, 210, 242, 254).

Hy. cellaria (incl. *hibernica* and *scharffi* (*sydneyensis*)). 152. **Hy. alliaria.** 148. **Hy. nitidula.** 147. **Hy. pura.** 137. **Hy. radiatula.** 142. **Hy. fulva.** 143. **Hy. crystallina.** 147. All general in shady places.

Zonitoides (*Zonites, Hyalinia*) **nitidus.** 112. Wet places generally, except north and east Scotland.

Z. excavatus. 67. Local on non-calcareous soils in woods, etc., north to Ross : north, west and south Ireland.

Arion ater. 151. General in wild and cultivated places.

A. subfuscus. 132. Mostly in woods; general except in east England.

A. minimus (*intermedius*). 133. Woods, hedgebanks, etc.; general.

A. hortensis. 150. General in gardens and wild places.

A. circumscriptus (*fasciatus*, *bourguignati*). 145. General in cultivated ground and woods.

Geomalacus maculosus. 1. This Lusitanian species occurs only in south-west Ireland and the north-west of France and Spain.

Punctum (*Helix*) **pygmæum.** 127. General in hedgebanks, woods, etc.

Pyramidula (*Helix*) **rupestris.** 83. On rocks, usually calcareous, stone walls, etc.; north to Perth; absent from East Anglia and rare in north Ireland.

P. rotundata. 151. Almost ubiquitous.

Eulota fruticum. 1. Deal in Kent E. (*Proc. Malac. Soc.*, xii, 124; xiii, 67).

Helicella (*Helix*) **virgata.** 94. Grassy places, downs, etc., especially on calcareous soil, north to South Ebudes and Northumberland N.; general in Ireland except in north-west. On old ballast heaps and probably introduced in Haddington, Fife and Perth and probably introduced in Donegal E.

H. itala (*ericetorum*). 100. Local on commons, grassy places, hedgebanks: north to Northumberland S.; west coast of Scotland and islands to Caithness; general in Ireland.

H. caperata *aggregate*. 124. Commons, hedgebanks, etc., generally. The earlier records were made before *heripensis* was distinguished as a separate species (1910: *Proc. Malac. Soc.*, x, 39); records for the segregates are hence imperfect. **H. caperata** *seg.* (55) from Kent and Cornwall to Ross and generally in Wales and Ireland. **H. heripensis** (*gigaxii*) (31) known only from Glamorgan, Dorset and Kent to Yorks.: satisfactory museum specimens extend to Haddington and unsatisfactory ones to Banff; except for a single record in Kildare it is not known in Ireland.

H. neglecta. 1. Known near Luddesdown in Kent W. since 1915 (*Proc. Malac. Soc.*, xii, 133).

Trochula (*Helix*) **elegans** (*terrestris*). 1. A colony of this Mediterranean species has been known near Dover, Kent E. since 1890 (*Journal*, vi, 377).

Cochlicella (*Helix*, *Bulimus*) **barbara** (*acuta*). 58. Grassy places and sandhills; maritime in England, Wales and Scotland on south and west coasts from Sussex to Caithness; more general and also inland in Ireland. Doubtful records Yorks. S.W. and Edinburgh.

Theba (*Helix*) **cantiana**. 48. Roadsides and rough ground Glamorgan, Devon and Kent to Durham; ballast heaps in Northumberland and Fife, presumably introduced. Not in Ireland.

T. cartusiana. 6. Grassy downs, especially near the sea, Hants., Sussex, Kent, Suffolk; requires confirmation from Norfolk and Somerset.

Ashfordia (*Helix*, *Hygromia*) **granulata** (*sericea*). 74. Mostly, but not exclusively, in damp or wet places; local, north to Hebrides and Elgin, apparently absent from west and central England; rare in Ireland; wants confirmation in Channel Islands.

Hygromia (*Helix*) **fusca**. 86. Woods, damp wild places, cliffs, etc., especially in autumn and winter; western and northern to Sutherland; very rare or absent in south-east England; generally in Ireland except central.

H. hispida (*concinna*). 137. General in wild and cultivated ground north to Kincardine; also in Orkney.

H. striolata (*rufescens*). 122. Gardens and wild places generally as far north as Perth.

H. umbrosa. 1. An established colony of this central European species at Margate, Kent E. in 1914 (Taylor, *Monograph*, iv, 65); appears to have since died out.

H. limbata (*odeca*). 1. Hedgebanks round Teignmouth in Devon S. since 1917 (*Proc. Malac. Soc.*, xiii, 14, 120); old museum specimens from Middlesex.

H. revelata (*subvirescens*). 5. Rough open ground by sea in Channel Islands, Cornwall, N. Devon and Lundy Is.

Acanthinula (*Helix*) **aculeata**. 120. Generally among dead leaves in woods, hedgebanks, etc.; holocene in Essex N. and Flint.

A. lamellata. 56. Local in old woods, Stafford to Sutherland; generally in Ireland except central; very rare in south England, Cardigan, Bucks and Kent E.; holocene in Essex N. and Notts.

Vallonia (*Helix*) **pulchella** *aggregate*. 134. General in wild and cultivated ground, not in woods, Orkney south. The three segregate forms (**V. pulchella** *seg.* (76), **V. excentrica** (68), **V. costata** (88) in drier places) have been separately recorded only since 1904: the imperfect records indicate no marked difference in distribution. Holocene *excentrica* Herts, Bedford, Donegal W.; *costata* Cheshire, Donegal W.

Helicodonta (*Helix*) **obvoluta**. 3. Hants N. and S. and Sussex W.; in woods, thickets and hedges, mostly beech, also oak and hazel, from three miles west of Winchester in a narrow zone along the South Downs to one mile east of river Arun; dead shells at Norbury in Surrey (*Journal*, xvi, 31, 44).

Helicigona (*Helix*) **lapicida**. 53. Woods, hedges, rocks, stone walls north to Yorks., especially on calcareous soil; Hawick in Roxburgh? now extinct; Fermoy in Cork E. (*Journal*, xiv, 160).

Arianta (*Helix*) **arbustorum**. 113. Uncultivated ground, marshy valleys and mountains generally in England, Wales and Scotland; rare in Ireland in north; doubtful record for Limerick.

Helix pomatia. 14. Local in hedges, copses, etc., on calcareous soil in south-eastern England from Suffolk W. and Cambridge to the Cotswold escarpment at Gloucester and to Kent E.; stray specimens alive at Exeter (Devon S.) and dead at Kentchurch (Hereford).

H. aspersa. 138. Gardens, cultivated and wild places, Hebrides and Elgin southwardly.

H. nemoralis. 138. Hedgebanks, woods, downs, sand-dunes, etc. Skye and Kincardine southwards.

H. hortensis. 126. Wild and cultivated ground generally; local in central, east and north Ireland.

Euparypha (*Helix*) **pisana**. 8. Local on sandhills by sea in Channel Isles, Porthcawl (Glamorgan) to Tenby (Pembroke), Louth, Meath and Dublin: thirteen miles inland at Muston Down, Dorset; museum specimens Falmouth and St. Ives, Cornwall W. Doubtful records from Eastbourne (Sussex W.) Gloucester and Scarborough (Yorks. N.E.).

Ena (*Bulimus*, *Buliminus*) **montana**. 11. Old woods, mostly beech, hedges and rocky places on calcareous soil in south England from Suffolk W. and Sussex W. to Gloucester and Somerset; dead shells (? holocene) at Stenwick (Northampton) and Aldbury (Herts.); doubtful museum record for Plymouth (Devon S.).

E. obscura. 99. Common in woods, hedges, etc., north to Elgin; infrequent in Ireland.

Opeas (*Stenogyra*) **goodalli**. 8. West Indian alien in greenhouses Herts to Cumberland. **O. urichi**. 1. West Indian alien in greenhouse in Cambridge. **Subulina octona**. 4. American alien in greenhouses Surrey to Lanark.

Cochlicopa lubrica. 153. Almost ubiquitous.

burgh, Berwick, Edinburgh, Banff and ten Irish areas from Cor[illegible]rk E. to Tyrone.

L. peregra. 153. Fresh and stagnant water generally.

L. involuta. 2. Barley Lake, Glengariff in Cork W. and Loc[illegible]ch Crincaum in Kerry N.

L. praetenuis. 1. L. Nagarriva in Kerry S. (*Irish Nat.*, xvi, 286[illegible]6; xvii, 45; xx, 46; xxi, 93; xxvii, 119; xxviii, 9).

L. burnetti. 5. Mountain lakes in Carmarthen, Dumfrie[illegible]s, Perth N., Fermanagh and Westmeath.

L. palustris. 127. Running and still water and splashes north t[illegible]o Ross generally.

L. truncatula. 145. Ponds, ditches and wet places generally.

L. stagnalis. 88. Ponds, slow rivers, canals north to Linlithgow [illegible]; possibly introduced in Scotland.

L. glabra. 34. Ponds, ditches and splashes north to Perth M. [illegible]; not uncommon in north England, rare in south; in Ireland only in Cork M. (*Irish Nat.*, xvi, 282; xxvii, 77) and requires confirmation; doubtful records in Wilts. N. and S.

Amphipeplea (*Limnæa*) **glutinosa.** 23. Rare in slow running water and lakes, Kent E. to Gloucester W. and Westmorland [illegible] central Ireland.

Planorbis corneus. 48. Slow rivers, canals and ponds, Kent and Somerset to Yorks. N.W.; absent from most of Wales and south-west England; in Scotland only in Lanark: in Ireland, Kildare, Sligo (? introduced) and doubtful in Limerick.

Pl. albus. 128. Running, still and stagnant water, north to Ross generally.

Pl. glaber (*parvus, lævis*). 52. Rare in lakes, etc., Kent and Somerset to Shetland and Cork to Donegal; more frequent in north. Records for Channel Islands, Wilts. N. and S., Dorset, Surrey and Banff require confirmation. Holocene in Yorks. S.E.

Pl. nautileus (*crista*). 112. Ponds generally.

Pl. dilatatus. 2. This North American alien has lived in the canals and rivers near Manchester since 1869 (*Journal*, i, 81; xvi, 100; *Lancs. Nat.*, xii (1919) 131).

Pl. carinatus. 80. Slow rivers, canals, lakes, generally in England and Ireland, except in west, and north to Edinburgh; requires confirmation for Isle of Wight and Tipperary S.

Pl. complanatus (*umbilicatus, marginatus*). 93. Ponds, rivers, canals generally in England and Ireland, except in west, and north to Edin[illegible] Doubtful in Channel Islands and Isle of Wight.

. vortex. 71. Running water, sometimes in ponds, in England generally and in Forfar and in Caithness : in Ireland mostly in Shannon basin; records for Londonderry, Down, Kildare, Wexford, Kilkenny, Cork E. and M. want confirmation.

. leucostoma (*spirorbis*). 125. Still and stagnant water and summer-drying ponds generally ; sparse in north Scotland.

ıthyomphalus (*Planorbis*) **contortus**. 120. Usually in running water also ponds and ditches generally.

ippeutis (*Planorbis*) **fontanus** (*nitidus*). 97. Ponds and ditches generally north to Ross.

gmentina (*Planorbis*) **nitida** (*lineatus*). 27. Rare in ponds and slow streams, mostly in eastern counties, as far north as Yorks. M.W. ; not in Ireland ; museum records for Elgin, Wilts. N. and S. and Dorset want confirmation.

ıysa fontinalis. 119. Running water and lakes north to Perth N. generally.

ı. heterostropha. 4. North American alien living in open in Gloucester W., Cheshire, Lancs. S. (since 1897) and Glamorgan.

ı. acuta. 8. Alien in greenhouse tanks and warm water, Surrey, etc., Lanark and Dublin.

ılexa (*Physa*) **hypnorum**. 97. Local in stagnant ponds and ditches, often dry in summer, north to Perth and doubtfully to Elgin.

ıludestrina (*Hydrobia*) **ventrosa**. 15. Brackish water north to Lincoln, and in Ireland.

jenkinsi. 68. Originally in brackish water (*Journal*, vi (1889), 142), has since spread widely into rivers, streams and canals ; north to Cumberland, also in Perth M. and generally in Ireland.

stagnalis (*ulvæ*). 41. Brackish and salt water from Cornwall and Kent to Ross, and in Ireland.

confusa (*similis*, *anatina*). 8. Brackish and nearly fresh water, Sussex W., Kent W. (probably extinct), Suffolk E., Norfolk E., Kilkenny, Clare, Limerick and Waterford.

nnicola taylori. 2. Probably an alien, of unknown origin, has lived in canals near Manchester since 1900 (*Journal*, xi, 9 ; *Lancs. Nat.*, xi (1918) 71).

thinia tentaculata. 104. Slow running water, lakes and ponds north to Stirling generally.

leachii. 47. Rather local in slow running water, south, central and east England, north to York ; rare in Ireland.

Paludina (*Vivipara*) **contecta**. 26. Canals and slow rivers. England mostly eastern, north to York M.W., introduced York N.E.: not in Wales, Scotland or Ireland.

P. vivipara. 42. Slow rivers, etc., in England generally north to Yorks. and west to Montgomery, Glamorgan and Devon S. in canals; dead shells Edinburgh and Limerick; not in Ireland.

Valvata piscinalis. 121. Running water and lakes north to Aberdeen S. generally.

V. macrostoma. 2. Running ditches Suffolk W. and Sussex E. (*Proc. Malac. Soc.*, ix, 123: x, 42).

V. cristata. 94. Slow streams, ditches, etc., north to Orkney: rare in Scotland.

Assiminea grayana. 3. Brackish water, Thames estuary and Suffolk E.

Pomatias (*Cyclostoma*) **elegans**. 46. Hedges and wild places on calcareous soil north to Westmorland: holocene (?) in Channel Isles; not in Scotland or Ireland.

Acme (*Acicula*) **lineata**. 42. Local in old woods and wild places, Kent E. and Devon N. to Renfrew; more frequent in Ireland. Doubtful in Somerset N.

Neritina (*Theodoxis*) **fluviatilis**. 62. Rivers and canals, hard and soft water, south, east and central England, north to Westmorland; central and west Ireland in calcareous districts. Its outlying occurrence in Orkney is verified from about 1850 (E. Forbes in British Museum) to 1916 (*Proc. Malac. Soc.*, xiii, 151). Wants confirmation Cornwall W. and Devon S.

Dreissena polymorpha. 38. Canals and rivers, Devon S. to Perth S.: not in Ireland: doubtful in Suffolk W.

Unio pictorum. 44. Young parasitic on fish (as are the five following species): ponds, rivers, lakes and canals north to Northumberland: not in Scotland or Ireland.

U. tumidus. 38. Rivers, canals and lakes in England except west, north to Yorks.: not in Scotland or Ireland.

Margaritana (*Unio*) **margaritifera**. 60. In soft water rivers generally except in south, east and central England and central Ireland. Wants confirmation in Dumfries and Shetland.

Anodonta cygnea. 86. Ponds, rivers, lakes and canals north to Elgin generally: central Ireland.

A. anatina. 54. Ponds, rivers and canals north to Edinburgh: not in Ireland.

Pseudanodonta sp. 5. Rivers and canals : species indeterminate, those from Thames said to be *P. elongata* (*Proc. Malac. Soc.*, ix, 111; *Journal*, xiii, 138) those from Worcester, Warwick and Stafford (*Journal*, xiii, 274 : *Proc. Malac. Soc.*, xii, 209) *P. rothomagensis.*

Sphærium rivicola. 32. Local in rivers and canals south and central England to Yorks. ; not in Scotland or Ireland : wants confirmation in Northumberland S.

S. corneum. 131. Ponds, streams, etc., generally.

S. lacustre. 93. Ponds, sometimes temporary, and stagnant water, rivers and canals north to Ross : not common in Scotland and Ireland.

S. pallidum (*ovale*). 12. Rare in canals and associated waters, Northampton and Gloucester to Montgomery and Yorks. : formerly in Surrey and Middlesex : dead shells in Bucks.

Pisidium amnicum. 95. Running water generally, lowland lakes and meres north to Perth M.

P. casertanum. 113. Ubiquitous.

P. henslowanum. 64. Running water, lakes and ponds generally north to Lanark.

P. hibernicum. 68. Ponds, streams, lakes, etc., generally (*Irish Nat.*, xxvii, 33).

P. lilljeborgi. 26. Mountain lakes, north-west England, Wales, Scotland and Ireland.

P. milium. 100. Ponds, rivers, canals, etc., generally.

P. nitidum. 108. Ponds, rivers, lakes, etc., generally.

P. obtusale. 90. Ponds and stagnant water generally.

P. parvulum. 20. Rivers and canals, Middlesex and Wilts. to Montgomery and Yorks. and in north and south Ireland.

P. personatum. 88. Stagnant water, puddles and temporary ponds generally.

P. pulchellum. 49. Ponds, streams and canals generally.

P. subtruncatum. 112. Ponds, rivers, canals, etc., generally.

P. supinum. 21. Rivers and canals, Surrey and Somerset to Yorks. : not in Wales, Scotland or Ireland.

P. tenuilineatum. 4. Rivers and canals, Berks., Oxford, Bucks., and Northampton (*Journal*, xv, 296).

◆

NAME OF SPECIES. Records in italics require confirmation.		ENGLAND.															
		Peninsula.								Channel.							
	0 Channel Islands	1a Scilly Isles	1 Cornwall West	2 Cornwall East	3 Devon South	4 Devon North	4a Lundy Island	5 Somerset South	6 Somerset North	7 Wiltshire North	8 Wiltshire South	9 Dorset	10 Isle of Wight	11 Hants South	12 Hants North	13 Sussex West	14 Sussex East
Testacellidæ																	
Testacella maugei ...	0	1a	1	...	3	4	..	5	6	...	8	9	...	11	...	...	...
T. haliotidea ...	...	...	...	...	3	4	...	...	...	...	8	...	10	11	...	13	14
T. scutulum ...	0	...	...	...	...	...	...	5	...	...	...	9	...	11	...	13	14
Limacidæ																	
Limax maximus ...	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
L. cinereoniger ...	...	...	...	...	3	4	...	...	...	7	8	...	...	11	12	13	14
L. tenellus	...	...	...	...	3	...	...	...	...	...	...	...	...	11	...	...	...
L. flavus	...	1a	1	2	3	...	...	5	6	7	8	9	10	11	12	13	14
L. arborum ..	...	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Agriolimax agrestis ...	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
A. lævis	...	...	1	2	3	4	..	...	..	7	8	9	10	11	12	13	14
Milax sowerbyi ...	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
M. gagates ...	0	...	1	2	3	4	...	5	6	7	...	9	10	11	12	...	14
Zonitidæ																	
Vitrina pellucida ...	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
V. pyrenaica ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hyalinia crystallina ..	0	..	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
H. lucida	0	...	1	2	3	4	...	5	6	...	...	9	...	11	12	...	...
H. cellaria ...	0	...	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
H. rogersi	0	..	1	2	3	4	...	5	6	7	...	9	10	...	...	...	...
H. alliaria	0	1a	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
H. nitidula... ...	0	1a	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
H. pura	0	...	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
H. radiatula ..	0	...	...	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
Euconulus fulvus ...	0	...	...	2	3	4	4a	5	6	7	8	...	10	11	12	13	14
Zonitoides nitidus ...	0	...	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	...
Z. excavatus ..	...	...	1	2	3	4	...	5	...	...	...	9	10	11	...	13	14
Arionidæ																	
Arion ater	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
A. subfuscus ...	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	...
A. minimus ..	...	...	1	2	3	4	...	5	...	7	8	9	...	11	12	13	14
A. hortensis ...	0	...	1	2	3	4	..	5	6	7	8	9	10	11	12	13	14
A. circumscriptus ...	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Geomalacus maculosus...	...	...	..	...	...	...	...	...	...	...	...	..	...	...	...	..	...
Helicidæ																	
Punctum pygmæum ...	0	...	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	...
Pyramidula rupestris ..	0	...	1	2	3	...	...	5	6	7	8	9	10	11	...	13	14
P. rotundata ...	0	1a	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
Eulota fruticum ...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...
Helicella virgata ...	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
H. itala	..	1a	1	...	...	...	...	5	6	7	8	9	10	11	12	13	14
H. caperata agg. ...	...	...	1	2	...	...	...	5	6	...	...	...	...	...	12	...	...
H. caperata seg. ...	0	1a	...	2	3	4	4a	5	6	7	8	9	10	11	...	13	14
H. heripensis ...	..	...	...	...	...	...	...	...	...	7	8	9	...	11	12	13	14
H. neglecta ...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
Trochula elegans ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cochlicella barbara ...	0	1a	1	2	3	4	...	...	6	...	...	9	10	...	...	13	14
Theba cantiana ...	0	...	...	...	3	..	...	5	6	7	8	9	10	11	12	13	14

ENGLAND.																	
Thames.									Ouse.								Name of Species.
16 Kent West	17 Surrey	18 Essex South	19 Essex North	20 Hertford	21 Middlesex	22 Berkshire	23 Oxford	24 Bucks.	25 Suffolk East	26 Suffolk West	27 Norfolk East	28 Norfolk West	29 Cambridge	30 Bedford	31 Huntingdon	32 Northampton	Records in italics require confirmation.
																	Testacellidæ
...	...	...	...	...	21	22	...	...	...	...	...	...	...	...	...	...	Testacella maugei
16	17	18	...	20	21	22	23	24	25	...	27	28	29	..	31	32	T. haliotidea
16	17	18	...	20	21	22	23	24	...	...	27	28	...	...	...	32	T. scutulum
																	Limacidæ
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Limax maximus
...	17	18	...	20	..	22	23	24	...	...	...	...	...	...	...	...	L. cinereoniger
...	17	18	...	20	..	...	23	24	...	...	...	...	...	...	...	...	L. tenellus
16	17	...	...	20	21	22	23	24	25	...	27	...	29	30	31	32	L. flavus
...	17	18	...	20	...	22	23	24	25	26	27	28	...	30	31	32	L. arborum
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Agriolimax agrestis
16	17	...	19	20	21	22	23	24	25	...	27	...	29	...	31	32	A. lævis
16	17	...	...	20	21	22	23	..	25	...	27	28	29	30	31	32	Milax sowerbyi
...	17	...	19	20	21	22	23	...	25	...	27	28	...	...	...	32	M. gagates
																	Zonitidæ
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Vitrina pellucida
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. pyrenaica
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Hyalinia crystallina
...	...	...	...	...	21	...	23	...	25	...	...	28	29	...	...	32	H. lucida
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. cellaria
16	17	18	19	20	21	22	23	24	25	26	27	...	29	30	31	32	H. rogersi
16	17	18	...	20	21	22	23	24	25	26	27	28	29	30	31	32	H. alliaria
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. nitidula
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. pura
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. radiatula
16	17	18	19	20	21	22	23	24	25	26	27	...	29	30	31	32	Euconulus fulvus
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Zonitoides nitidus
...	17	...	...	20	...	22	23	24	...	...	...	...	...	...	...	...	Z. excavatus
																	Arionidæ
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Arion ater
16	17	...	..	20	21	22	23	24	...	...	...	...	...	30	31	32	A. subfuscus
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	A. minimus
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	A. hortensis
16	17	18	...	20	21	22	23	...	25	...	27	28	29	30	31	32	A. circumscriptus
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Geomalacus maculosus
																	Helicidæ
16	17	18	19	20	21	22	23	24	25	26	27	...	29	30	31	32	Punctum pygmæum
...	17	...	..	20	...	22	23	...	.	...	...	...	...	30	...	32	Pyramidula rupestris
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. rotundata
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Eulota fruticum
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Helicella virgata
16	17	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. itala
...	...	18	19	...	...	22	23	24	25	26	27	28	29	30	...	32	H. caperata agg.
16	17	...	19	20	21	22	..	...	...	...	...	...	...	...	31	...	H. caperata seg.
16	17	...	...	20	21	22	23	24	25	...	27	...	29	30	31	32	H. heripensis
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. neglecta
...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	Trochula elegans
...	...	...	...	...	...	...	...	...	...	.	..	...	...	...	...	...	Cochlicella barbara
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Theba cantiana

Name of Species.		ENGLAND.															
		Peninsula.								**Channel.**							
Records in italics require confirmation.	0 Channel Islands	1a Scilly Isles	1 Cornwall West	2 Cornwall East	3 Devon South	4 Devon North	4a Lundy Island	5 Somerset South	6 Somerset North	7 Wiltshire North	8 Wiltshire South	9 Dorset	10 Isle of Wight	11 Hants South	12 Hants North	13 Sussex West	14 Sussex East
T. cartusiana ...	...	...	...	...	...	...	...	...	*6*	...	...	...	...	11	...	13	14
Ashfordia granulata ...	*0*	1a	1	2	3	4	4a	5	6	7	8	9	...	11	12	...	...
Hygromia fusca ...	...	...	1	2	3	4	...	5	6	7	..	9	...	11	12	13	...
H. hispida ...	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
H. striolata ...	...	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
H. umbrosa ...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
H. limbata... ...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...
H. revelata ...	0	1a	1	2	3	4	4a	...	...	...	...	...	...	...	..	...	...
Acanthinula aculeata ...	0	...	1	2	3	4	4a	5	...	7	8	9	10	11	12	13	14
A. lamellata ..	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vallonia pulchella agg....	0	...	1	2	...	4	...	5	6	7	...	...	..	11	...	...	...
V. pulchella seg. ...	...	...	...	2	3	...	...	...	...	7	8	9	10	...	12	13	14
V. excentrica ...	...	...	1	...	3	4	4a	...	6	7	8	9	10	11	...	13	14
V. costata	..	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Helicodonta obvoluta ...	...	...	...	...	...	...	...	...	...	...	...	...	...	11	12	13	...
Helicigona lapicida ...	...	...	...	...	3	4	...	5	6	7	8	9	10	11	12	13	14
Arianta arbustorum ...	...	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Helix pomatia ...	...	...	...	...	*3*	...	...	...	...	7	...	...	...	...	12	..	...
H. aspersa	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
H. nemoralis ...	0	1a	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
H. hortensis ...	*0*	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Euparypha pisana ..	0	...	1	...	...	...	...	...	...	...	...	9	...	...	...	...	...
Buliminidæ																	
Ena montana ...	...	...	..	...	*3*	...	...	...	6	...	8	...	...	11	12	13	...
E. obscura ..	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Stenogyridæ																	
Cochlicopa lubrica ...	0	1a	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
Azeca tridens ..	...	...	1	...	...	4	...	...	6	7	8	...	...	11	12	13	14
Cæcilioides acicula ...	...	...	...	2	...	4	...	5	6	7	8	9	10	11	12	13	14
Pupidæ																	
Pupa marginata ...	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
P. umbilicata ...	0	1a	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
P. anglica	0	...	...	2	...	...	4a	...	...	...	...	..	...	...	...	...	...
P. secale	...	...	1	...	3	..	...	..	6	7	8	9	10	...	...	13	14
Vertigo antivertigo ...	0	...	...	2	3	4	...	...	...	7	8	9	*10*	11	..	...	14
V. substriata ...	0	...	...	...	...	4	4a	...	...	7	...	...	...	...	...	...	...
V. pygmæa ...	0	...	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
V. moulinsiana ...	...	...	...	...	...	4	...	..	...	...	...	9	10	11	...	...	...
V. lilljeborgi ...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
V. alpestris ...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...
V. pusilla	...	...	...	...	*3*	4	...	..	...	...	...	...	...	...	...	..	...
V. angustior ...	...	...	...	...	...	...	.	...	..	...	...	...	...	...	...	...	...
Sphyradium edentulum...	0	...	...	...	3	4	4a	5	6	7	8	...	10	11	12	...	...
S. minutissimum ...	...	...	...	...	...	...	...	...	...	...	...	9	10	...	...	...	...
Clausiliidæ																	
Balea perversa ...	0	1a	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
Clausilia laminata ...	...	...	...	...	3	4	...	5	6	7	8	9	10	11	12	13	14
[illegible] ...	..	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...

ENGLAND.															Name of Species.
hames.							Ouse.								Records in italics require confirmation.
Essex	19 Essex North	20 Hertford	21 Middlesex	22 Berkshire	23 Oxford	24 Bucks.	25 Suffolk East	26 Suffolk West	27 Norfolk East	28 Norfolk West	29 Cambridge	30 Bedford	31 Huntingdon	32 Northampton	
.	...	...	...	...	...	...	25	26	*27*	...	...	...	...	...	T. cartusiana
.	19	20	21	22	23	24	25	26	27	...	29	30	...	32	Ashfordia granulata
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Hygromia fusca
8	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. hispida
.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. striolata
.	...	...	..	...	...	...	...	...	...	...	...	...	...	...	H. umbrosa
.	...	...	*21*	...	..	...	...	..	...	...	...	...	...	...	H. limbata
..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. revelata
8	...	20	21	22	23	24	25	26	27	28	29	30	31	32	Acanthinula aculeata
..	...	..	...	...	...	24	...	...	...	...	...	...	...	...	A. lamellata
..	19	...	..	22	23	...	...	...	27	28	...	30	...	32	Vallonia pulchella agg.
8	19	20	21	...	...	...	25	26	...	...	29	...	31	...	V. pulchella seg.
..	...	20	21	22	23	24	25	26	27	28	29	..	...	32	V. excentrica
8	19	20	21	22	23	24	25	26	27	28	29	30	31	32	V. costata
..	...	...	...	...	...	...	...	..	...	...	...	...	...	...	Helicodonta obvoluta
8	19	20	21	22	23	24	25	26	27	..	29	30	31	32	Helicigona lapicida
..	19	20	21	22	23	24	25	26	27	...	29	30	31	32	Arianta arbustorum
..	19	20	...	...	23	...	...	26	...	...	29	30	...	32	Helix pomatia
8	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. aspersa
8	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. nemoralis
8	19	20	21	22	23	24	25	26	27	28	29	30	31	32	H. hortensis
..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Euparypha pisana
															Buliminidæ
..	...	*20*	...	22	23	24	...	26	...	..	...	...	...	*32*	Ena montana
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	E. obscura
															Stenogyridæ
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Cochlicopa lubrica
.	19	20	...	22	23	24	25	26	27	...	...	30	...	32	Azeca tridens
18	19	20	...	22	23	...	25	26	...	28	29	30	31	32	Cæcilioides acicula
															Pupidæ
18	19	20	21	22	23	24	25	26	27	28	29	30	31.	32	Pupa marginata
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. umbilicata
..	...	...	...	...	...	24	...	...	...	...	...	...	...	..	P. anglica
...	...	20	21	*22*	23	24	...	...	...	...	...	...	...	...	P. secale
...	19	20	21	22	23	...	25	26	27	..	29	30	...	32	Vertigo antivertigo
18	...	...	...	22	..	24	25	26	...	28	..	...	...	32	V. substriata
18	...	20	*21*	22	23	24	25	26	27	28	29	30	31	32	V. pygmæa
..	*19*	20	21	22	23	...	25	26	27	...	29	...	.	...	V. moulinsiana
...	...	...	...	...	...	..	...	...	...	...	...	..	...	...	V. lilljeborgi
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. alpestris
...	..	..	...	22	23	24	25	26	27	28	...	...	...	32	V. pusilla
...	...	...	...	...	...	..	25	...	27	...	...	...	...	...	V. angustior
18	19	20	21	22	23	24	25	26	27	28	29	..	...	32	Sphyradium edentulum
...	...	...	...	...	...	...	25	...	...	...	...	...	...	...	S. minutissimum
															Clausiliidæ
18	19	20	...	22	23	24	25	26	27	28	29	30	..	32	Balea perversa
...	19	20	...	22	23	24	25	26	27	28	29	30	31	32	Clausilia laminata
18	...	*20*	21	...	...	...	...	...	...	...	29	...	...	...	C. biplicata

NAME OF SPECIES.		ENGLAND.															
		Peninsula.								Channel.							
Records in italics require confirmation.	0 Channel Islands	1a Scilly Isles	1 Cornwall West	2 Cornwall East	3 Devon South	4 Devon North	4a Lundy Island	5 Somerset South	6 Somerset North	7 Wiltshire North	8 Wiltshire South	9 Dorset	10 Isle of Wight	11 Hants South	12 Hants North	13 Sussex West	14 Sussex East
C. cravenensis	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C. bidentata	0	...	1	2	3	4	4a	5	6	7	8	9	10	11	12	13	14
C. rolphii	...	...	...	...	3	...	...	...	*6*	7	8	...	...	11	12	13	14
Succineidæ																	
Succinea putris	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
S. elegans	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	...	13	14
S. oblonga	...	...	...	...	...	4	...	...	6	...	..	...	...	...	...	...	...
Auriculidæ																	
Carychium minimum	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Phytia myosotis	*0*	...	1	...	...	4	4a	...	6	...	...	*9*	...	...	...	...	14
Ovatella bidentata	*0*	.	*1*	...	3	4	...	..	...	..	...	...	...	...	...	..	...
Ancylidæ																	
Ancylus fluviatilis	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
A. lacustris	...	...	...	...	3	...	...	...	6	7	8	9	10	11	...	13	14
Limnæidæ																	
Limnæa auricularia	...	...	...	...	3	...	...	...	6	7	8	...	10	11	.	13	14
L. peregra	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
L. burnetti	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
L. prætenuis	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
L. involuta	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
L. palustris	0	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
L. truncatula	0	...	1	2	3	4	4a	5	6	7	8	9	...	11	12	13	14
L. stagnalis	...	...	...	...	*3*	...	...	5	6	7	8	9	...	11	12	13	14
L. glabra	0	...	1	2	*3*	...	...	...	...	*7*	*8*	9	...	11	...	13	14
Amphipeplea glutinosa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Planorbidæ																	
Planorbis corneus	...	...	...	...	...	...	...	...	6	7	8	...	...	11	12	13	14
P. albus	...	...	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
P. glaber	*0*	...	...	...	3	...	...	...	6	*7*	*8*	*9*	...	...	...	13	...
P. nautileus	0	...	1	2	3	4	...	5	6	...	..	9	10	11	12	13	14
P. dilatatus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
P. carinatus	...	...	...	...	3	...	...	5	6	7	8	9	*10*	11	...	13	14
P. complanatus	*0*	...	...	...	3	4	...	5	6	7	8	9	*10*	11	12	13	14
P. vortex	0	...	...	2	3	. .	...	5	6	7	8	9	10	11	12	13	14
P. leucostoma	0	1a	1	2	3	4	...	5	6	7	8	9	10	11	12	13	14
Bathyomphalus contortus	...	...	...	...	3	4	...	5	6	7	8	9	...	11	...	13	14
Hippeutis fontanus	...	...	...	...	3	...	...	5	6	7	8	9	...	11	12	13	14
Segmentina nitida	...	...	...	...	...	...	...	...	...	*7*	*8*	*9*	...	11	12	...	14
Physidæ																	
Physa fontinalis	...	...	..	...	3	4	...	5	6	7	8	9	10	11	...	13	14
P. heterostropha	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...
Aplexa hypnorum	0	...	1	...	3	4	...	5	6	7	8	9	...	11	...	13	14
Paludestrinidæ																	
Paludestrina ventrosa	0	...	...	...	...	...	...	...	6	...	...	9	...	...	...	13	...
P. jenkinsi	...	...	...	2	3	4	...	...	6	...	...	9	..	11	12	13	14
P. stagnalis	...	...	1	2	3	4	...	...	6	...	...	..	10	...	...	...	...
P. confusa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13	...
Amnicola	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...
Bithynia	...	..	1	...	3	4	...	5	6	7	8	9	10	11	12	13	14

ENGLAND.															
Thames.							Ouse.								Name of Species.
18 Essex South	19 Essex North	20 Hertford	21 Middlesex	22 Berkshire	23 Oxford	24 Bucks.	25 Suffolk East	26 Suffolk West	27 Norfolk East	28 Norfolk West	29 Cambridge	30 Bedford	31 Huntingdon	32 Northampton	Records in italics require confirmation.
18	...	...	...	...	*23*	...	*25*	...	...	...	...	...	...	32	C. cravenensis
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	C. bidentata
...	...	20	...	22	...	.	...	...	...	...	...	...	..	32	C. rolphii
															Succineidæ
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Succinea putris
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	S. elegans
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	S. oblonga
															Auriculidæ
18	19	20	21	22	23	24	25	...	27	28	29	30	31	32	Carychium minimum
18	19	...	...	...	...	...	25	...	...	...	...	...	...	...	Phytia myosotis
18	19	...	...	...	...	...	25	...	...	...	...	..	...	...	Ovatella bidentata
															Ancylidæ
18	19	20	21	22	23	24	25	...	27	28	29	30	...	32	Ancylus fluviatilis
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	A. lacustris
															Limnæidæ
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Limnæa auricularia
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	L. peregra
...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	L. burnetti
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	L. prætenuis
...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	L. involuta
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	L. palustris
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	L. truncatula
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	L. stagnalis
...	19	20	...	22	...	...	...	...	...	28	...	...	...	...	L. glabra
...	...	...	...	22	23	24	25	...	27	...	...	...	*31*	...	Amphipeplea glutinosa
															Planorbidæ
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Planorbis corneus
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. albus
18	...	...	21	...	23	...	...	...	27	...	...	...	...	...	P. glaber
18	19	20	21	22	23	24	25	26	27	28	29	30	...	32	P. nautileus
...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	P. dilatatus
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. carinatus
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. complanatus
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. vortex
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. leucostoma
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Bathyomphalus contortus
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Hippeutis fontanus
...	...	20	21	22	23	...	25	26	27	28	29	...	...	32	Segmentina nitida
															Physidæ
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Physa fontinalis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. heterostropha
18	19	20	21	22	23	24	25	26	27	28	29	...	31	32	Aplexa hypnorum
															Paludestrinidæ
18	19	...	...	...	...	...	...	...	..	...	...	...	...	...	Paludestrina ventrosa
18	19	20	21	...	23	24	25	...	...	...	29	...	...	32	P. jenkinsi
18	19	...	...	...	...	...	25	..	...	...	...	...	...	...	P. stagnalis
...	...	...	...	...	...	...	...	...	27	...	...	..	...	...	P. confusa
...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	Amnicola taylori
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Bithynia tentaculata

NAME OF SPECIES. Records in italics require confirmation.		ENGLAND.													
		Peninsula.								Channel.					
	0 Channel Islands	1a Scilly Isles	1 Cornwall West	2 Cornwall East	3 Devon South	4 Devon North	4a Lundy Island	5 Somerset South	6 Somerset North	7 Wiltshire North	8 Wiltshire South	9 Dorset	10 Isle of Wight	11 Hants South	12 Hants North
B. leachii	...	...	...	...	*3*	...	...	...	6	7	8	...	...	11	12
Viviparidæ															
Paludina contecta ...	...	...	...	...	...	...	...	...	...	...	...	...	...	11	...
P. vivipara.. ..	...	...	...	...	3	...	...	...	6	7	8	...	...	...	12
Valvatidæ															
Valvata piscinalis ...	...	...	1	...	3	4	...	5	6	7	8	9	10	11	12
V. macrostoma ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. cristata	...	...	...	...	3	...	...	...	6	...	8	9	..	11	12
Assemaniidæ															
Assemania grayana ...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Pomatiidæ															
Cyclostoma elegans ...	*0*	...	1	2	3	4	...	5	6	7	8	9	10	11	12
Aciculidæ															
Acme lineata ...	...	...	...	...	...	4	...	...	*6*	...	...	...	...	...	...
Neritidæ															
Neritina fluviatilis ...	...	..	...	...	*3*	...	...	5	6	7	8	9	...	11	...
Dreissenidæ															
Dreissena polymorpha	...	...	...	...	3	.	...	...	6	7	8	...	...	...	...
Unionidæ															
Unio pictorum ...	...	...	...	..	3	...	...	...	6	7	8	9	...	...	12
U. tumidus... ...	...	...	...	...	...	...	...	...	6	7	8	9	...	...	...
Marg. margaritifera ..	...	...	...	2	3	4	...	...	...	...	...	...	...	..	...
Anodonta cygnea ...	...	...	...	2	3	4	...	...	6	7	8	9	10	11	12
A. anatina	...	..	...	...	*3*	4	...	...	6	7	8	...	...	11	..
Pseudanodonta sp. ...	..	...	...	...	...	...	...	...	...	...	..	...	...	...	...
Cyrenidæ															
Sphærium rivicola ...	...	...	...	...	...	...	...	...	6	7	8	9	...	...	...
S. corneum ...	0	...	...	...	3	4	...	5	6	7	8	9	10	11	12
S. lacustre	0	...	...	...	3	4	...	5	6	7	8	9	10	11	12
S. pallidum ...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...
Pisidium amnicum ...	...	...	1	2	3	...	...	5	6	7	8	9	..	11	...
P. casertanum ...	0	...	1	2	3	4	...	5	6	7	8	...	10	11	...
P. henslowanum ...	...	...	...	2	...	...	...	...	6	7	8	...	..	11	...
P. hibernicum ...	...	...	...	...	3	4	...	...	6	...	...	...	..	...	...
P. lilljeborgi ...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...
P. milium	0	...	...	...	3	4	...	5	6	...	...	9	10	...	...
P. nitidum... ...	0	...	1	2	3	4	...	...	6	7	8	...	10	11	..
P. obtusale ...	0	...	1	..	...	...	...	...	6	7	8	..	...	11	...
P. parvulum ...	...	...	...	...	...	...	...	...	...	7	8	...	...	...	...
P. personatum ...	0	...	...	...	...	4	...	5	6	...	8	..	...	11	...
P. pulchellum ...	...	...	...	...	3	...	...	...	...	...	...	...	10	...	...
P. subtruncatum ...	0	...	...	2	3	4	...	5	6	7	8	9	...	11	...
P. supinum ...	...	...	...	...	...	...	..	...	6	..	...	...	...	...	..
P. tenuilineatum ...	...	...	...	...	...	...	...	...	..	...	...	...	...	..	..
Total species 163	67	25	74	74	103	94	28	83	107	101	101	97	79	108	[illegible]

ENGLAND.																		Name of Species.
Thames.										Ouse.								
15 Kent East	16 Kent West	17 Surrey	18 Essex South	19 Essex North	20 Hertford	21 Middlesex	22 Berkshire	23 Oxford	24 Bucks.	25 Suffolk East	26 Suffolk West	27 Norfolk East	28 Norfolk West	29 Cambridge	30 Bedford	31 Huntingdon	32 Northampton	Records in italics require confirmation.
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	B. leachii
																		Viviparidæ
...	...	17	...	19	...	21	22	23	24	25	26	27	28	29	30	31	32	Paludina contecta
15	16	17	18	19	20	21	22	23	24	25	...	27	...	...	...	31	32	P. vivipara
																		Valvatidæ
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Valvata piscinalis
...	...	...	...	...	...	...	...	...	...	...	26	...	...	...	...	...	...	V. macrostoma
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	V. cristata
																		Assemaniidæ
...	16	...	18	...	...	...	...	...	...	25	...	...	...	...	...	...	...	Assemania grayana
																		Pomatiidæ
15	16	17	...	19	20	21	22	23	24	25	26	27	28	29	30	...	32	Cyclostoma elegans
																		Aciculidæ
15	...	...	...	...	20	...	22	23	24	25	...	...	...	...	...	...	32	Acme lineata
																		Neritidæ
15	*16*	17	18	19	20	21	22	23	24	25	26	27	..	29	30	31	32	Neritina fluviatilis
																		Dreissenidæ
...	...	17	18	...	20	21	22	23	24	...	*26*	...	...	29	30	31	32	Dreissena polymorpha
																		Unionidæ
15	16	17	18	19	20	21	22	23	24	25	26	27	...	29	30	31	32	Unio pictorum
15	16	17	18	19	20	21	22	23	24	..	...	27	...	29	30	31	32	U. tumidus
...	...	...	...	...	..	...	..	...	...	...	...	...	...	...	...	...	...	Margaritana margaritifera
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Anodonta cygnea
15	16	17	18	19	20	21	22	23	24	25	26	27	...	29	30	...	32	A. anatina
...	...	17	...	...	...	21	...	...	...	...	...	...	...	...	...	...	...	Pseudanodonta sp.
																		Cyrenidæ
15	16	17	...	19	20	21	22	23	24	...	...	...	...	...	...	..	32	Sphærium rivicola
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	S. corneum
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	S. lacustre
...	...	*17*	..	...	...	*21*	...	...	*24*	...	..	...	...	...	...	...	32	S. pallidum
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Pisidium amnicum
15	16	17	...	...	20	21	22	23	24	...	26	27	...	29	30	...	32	P. casertanum
15	...	17	18	19	20	21	22	23	24	25	26	...	...	29	30	31	32	P. henslowanum
...	...	17	...	19	20	...	22	...	24	...	26	...	...	29	30	31	...	P. hibernicum
...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	..	...	P. lilljeborgi
15	...	17	18	19	20	21	22	...	24	25	26	27	28	29	30	31	32	P. milium
15	...	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	...	P. nitidum
15	16	17	...	...	20	21	..	...	24	25	26	27	28	...	...	31	...	P. obtusale
...	...	17	...	...	20	21	22	23	24	...	...	...	...	...	30	...	32	P. parvulum
...	...	17	18	19	20	21	22	...	...	25	26	27	...	...	...	...	32	P. personatum
...	...	17	...	..	20	...	22	...	24	25	26	27	28	...	...	...	...	P. pulchellum
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	P. subtruncatum
...	...	17	...	...	20	21	22	23	24	...	...	...	...	29	30	31	32	P. supinum
...	..	...	...	...	...	...	22	23	24	...	...	...	...	...	...	...	32	P. tenuilineatum
114	97	118	92	93	115	105	117	115	110	110	95	103	84	99	94	87	112	*Total species* 163

NAME OF SPECIES.	ENGLAND AND WALES.																			
	Severn.								South Wales.						North Wales.					
Records in italics require confirmation.	33 Gloucester E.	34 Gloucester W.	35 Monmouth	36 Hereford	37 Worcester	38 Warwick	39 Stafford	40 Salop	41 Glamorgan	42 Brecon	43 Radnor	44 Carmarthen	45 Pembroke	46 Cardigan	47 Montgomery	48 Merioneth	49 Carnarvon	50 Denbigh	51 Flint	52 Anglesea
Testacellidæ																				
Testacella maugei ...	33	34	35	36	37	38	...	...	41	...	...	...	45	...	...	...	...	...	...	...
T. haliotidea ...	...	34	35	...	37	38	39	...	...	...	43	...	..	...	...	...	...	...	...	...
T. scutulum ...	...	...	...	...	37	38	39	...	41	...	...	...	...	...	...	...	49	...	...	...
Limacidæ																				
Limax maximus ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
L. cinereoniger ...	...	34	...	...	...	38	39	40	41	42	43	...	...	46	...	48	49	50	..	...
L. tenellus ...	..	34	...	36	37	...	39	40	...	42	...	...	...	...	47	...	...	...	..	...
L. flavus ...	33	34	...	36	37	38	39	40	41	42	...	44	45	...	47	...	49	50	51	...
L. arborum ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	...	52
Agriolimax agrestis ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
A. lævis ...	...	..	35	...	37	...	39	40	41	42	43	...	...	...	47	48	49	50	51	52
Milax sowerbyi ...	33	34	35	36	37	38	39	40	41	...	...	44	45	46	...	...	49	50	51	..
M. gagates ...	...	34	35	36	...	38	39	40	41	42	...	...	45	46	...	...	49	...	...	52
Zonitidæ																				
Vitrina pellucida	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
V. pyrenaica ...	..	...	...	..	...	...	...	...	...	...	..	..	...	..	...	...	...	...	...	...
Hyalinia crystallina ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
H. lucida ...	...	34	35	...	..	...	...	...	41	...	43	44	45	...	...	...	49	50	...	52
H. cellaria ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
H. rogersi ...	...	34	35	...	...	38	39	40	41	42	43	44	...	..	47	48	49	50	51	52
H. alliaria ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
H. nitidula ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
H. pura ...	33	34	35	36	37	38	39	40	41	42	43	44	...	46	47	48	49	50	51	52
H. radiatula ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Euconulus fulvus ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Zonitoides nitidus ...	33	34	35	36	37	38	39	40	41	42	...	...	45	46	...	48	49	...	51	52
Z. excavatus ...	...	...	...	...	...	38	39	...	41	42	...	...	45	46	...	48	49	...	...	...
Arionidæ																				
Arion ater ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
A. subfuscus ...	...	34	35	...	37	38	39	40	41	42	43	44	45	46	47	48	49	50	...	52
A. minimus ...	..	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
A. hortensis ..	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
A. circumscriptus ...	33	34	35	36	37	38	39	40	41	42	43	44	45	...	47	48	49	50	51	52
Geomalacus maculosus	...	...	. .	...	...	...	..	...	...	...	...	..	...	...	...	...	...	...	...	...
Helicidæ																				
Punctum pygmæum ...	33	...	35	36	37	38	39	...	41	42	43	44	45	46	...	48	49	50	51	52
Pyramidula rupestris ...	33	34	35	36	37	38	39	...	41	42	..	44	45	46	...	48	49	50	51	52
P. rotundata ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Eulota fruticum ...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	..	...	...
Helicella virgata ...	33	34	35	36	37	38	39	...	41	...	...	44	45	46	...	48	49	50	51	52
H. itala ...	33	34	...	36	37	38	39	40	41	...	...	44	45	...	..	...	49	50	...	52
H. caperata agg. ...	33	34	35	36	37	38	...	40	...	42	43	44	45	...	47	48	...	50	...	52
H. caperata seg. ...	33	...	..	36	...	...	39	...	41	42	...	...	...	46	...	48	49	50	51	52
H. heripensis ...	33	...	...	36	...	38	39	...	41	...	...	...	...	...	...	...	...	...	51	...
H. neglecta ...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trochula elegans ...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	..	...	...	...	...
Cochlicella barbara ...	...	34	...	...	...	...	...	...	41	...	...	44	45	...	...	*48*	49	50	51	52
Theba cantiana ...	33	34	35	36	37	38	...	40	41	...	...	...	...	...	...	...	...	...	...	...

ENGLAND.

nt.			Mersey.			Humber.					Tyne.			Lakes.			NAME OF SPECIES.
	56 Nottingham	57 Derby	58 Cheshire	59 Lancashire S.	60 Lancashire W.	61 York S.E.	62 York N.E.	63 York S.W.	64 York Mid W.	65 York N.W.	66 Durham	67 Northumb. S.	68 Cheviotland	69 Westmorland	70 Cumberland	71 Isle of Man	Records in italics require confirmation.
																	Testacellidæ
..	...	...	58	...	...	...	...	...	...	...	...	...	...	...	...	...	Testacella maugei
..	56	57	58	59	...	61	...	63	...	...	66	...	...	...	...	...	T. haliotidea
5	56	57	58	59	...	61	62	63	64	...	66	67	...	...	...	...	T. scutulum
																	Limacidæ
5	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Limax maximus
..	...	57	58	...	...	61	62	63	64	65	...	...	68	69	70	71	L. cinereoniger
..	...	...	...	...	...	...	...	...	...	65	...	67	...	...	...	...	L. tenellus
5	56	...	58	59	60	61	62	63	64	65	*66*	67	...	69	70	71	L. flavus
..	56	57	58	59	...	61	62	63	64	65	66	67	68	69	70	71	L. arborum
5	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Agriolimax agrestis
5	56	...	58	59	60	61	62	63	64	65	66	67	68	69	70	71	A. lævis
5	...	...	58	59	60	61	62	63	64	...	...	67	...	...	...	71	Milax sowerbyi
5	56	...	58	59	60	61	62	63	...	...	66	...	68	...	*70*	71	M. gagates
																	Zonitidæ
5	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Vitrina pellucida
..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		V. pyrenaica
5	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Hyalinia crystallina
..	...	...	...	59	60	61	...	63	...	...	...	...	...	69	70	71	H. lucida
5	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. cellaria
5	56	57	58	59	60	...	62	63	64	65	66	67	68	69	70		H. rogersi
5	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	7	H. alliaria
5	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	7	H. nitidula
..	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. pura
..	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. radiatula
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Euconulus fulvus
55	56	57	58	59	60	61	62	63	64	...	...	67	68	69	70	71	Zonitoides nitidus
...	...	57	58	59	60	...	62	63	64	...	66	...	...	69	70	...	Z. excavatus
																	Arionidæ
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Arion ater
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	A. subfuscus
55	56	57	58	59	60	61	62	63	64	65	...	67	68	69	70	71	A. minimus
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	A. hortensis
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	A. circumscriptus
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Geomalacus maculosus
																	Helicidæ
...	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Punctum pygmæum
...	...	57	...	...	60	...	62	63	64	65	66	...	...	69	70	71	Pyramidula rupestris
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	P. rotundata
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Eulota fruticum
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	...	Helicella virgata
55	56	57	58	59	60	61	62	63	64	65	66	67	...	69	70	71	H. itala
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. caperata agg.
...	56	...	...	...	...	61	62	...	...	...	...	...	...	69	70	71	H. caperata seg.
...	...	...	...	...	...	61	62	63	...	...	...	...	...	...	...	...	H. heripensis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. neglecta
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Trochula elegans
...	...	...	58	...	60	...	...	*63*	...	...	...	...	...	...	*70*	71	Cochlicella barbara
55	56	...	...	...	...	61	62	63	64	65	66	*67*	...	...	...	...	Theba cantiana

NAME OF SPECIES.	ENGLAND AND WALES.																			
	Severn.								South Wales.						North Wales.					
Records in italics require confirmation.	33 Gloucester E.	34 Gloucester W.	35 Monmouth	36 Hereford	37 Worcester	38 Warwick	39 Stafford	40 Salop	41 Glamorgan	42 Brecon	43 Radnor	44 Carmarthen	45 Pembroke	46 Cardigan	47 Montgomery	48 Merioneth	49 Carnarvon	50 Denbigh	51 Flint	52 Anglesea
T. cartusiana	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashfordia granulata	33	34	...	...	...	...	...	...	41	...	...	44	45	...	...	48	49	50	51	52
Hygromia fusca	...	34	35	36	37	...	39	...	41	42	...	44	45	46	47	48	49	50	51	...
H. hispida	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
H. striolata	33	34	35	36	37	38	39	40	41	42	43	44	45	46	...	48	49	50	51	52
H. umbrosa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. limbata	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. revelata	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Acanthinula aculeata	33	34	35	36	37	38	39	40	41	42	43	44	45	...	47	48	49	50	51	52
A. lamellata	...	...	...	...	...	...	39	...	...	...	...	...	...	46	...	...	...	...	...	...
Vallonia pulchella agg.	33	...	...	...	...	38	39	...	...	42	...	...	...	...	...	...	49	...	51	...
V. pulchella seg.	...	34	35	36	37	...	...	...	41	...	43	...	45	46	...	48	...	50	...	52
V. excentrica	...	...	...	36	37	38	...	...	41	...	...	...	45	...	...	...	49	50	51	52
V. costata	...	34	...	36	37	38	39	...	41	42	43	...	...	...	...	48	...	50	51	52
Helicodonta obvoluta	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Helicigona lapicida	33	34	35	36	37	38	39	...	41	42	43	...	...	...	47	...	...	50	...	...
Arianta arbustorum	33	34	35	36	37	38	39	40	41	42	43	44	45	46	...	48	49	50	51	52
Helix pomatia	33	34	...	*36*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. aspersa	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
H. nemoralis	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
H. hortensis	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Euparypha pisana	*33*	...	...	...	...	...	...	...	41	...	...	...	45	...	...	...	...	...	...	...
Buliminidæ																				
Ena montana	33	34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
E. obscura	33	34	35	36	37	38	39	40	41	42	43	44	45	...	47	...	49	50	51	52
Stenogyridæ																				
Cochlicopa lubrica	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Azeca tridens	33	34	35	36	37	38	39	...	41	42	43	...	...	...	47	48	...	50	51	...
Cæcilioides acicula	33	34	...	36	37	...	39	...	41	...	...	44	45	...	...	...	...	50	...	52
Pupidæ																				
Pupa marginata	33	34	...	...	37	...	...	40	41	...	...	...	45	46	...	48	49	50	51	52
P. umbilicata	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
P. anglica	33	...	...	36	...	...	...	...	...	...	...	...	45	...	...	48	49	...	...	52
P. secale	33	34	35	36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vertigo antivertigo	33	34	...	36	...	...	39	*40*	41	...	43	...	45	...	...	48	49	50	...	52
V. substriata	...	...	...	...	...	...	39	...	41	...	...	...	45	...	...	48	49	50	...	52
V. pygmæa	33	34	...	36	37	38	39	...	41	42	43	...	45	...	...	48	49	50	51	52
V. moulinsiana	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. lilljeborgi	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. alpestris	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*48*	...	...	...	...
V. pusilla	...	...	...	...	37	38	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. angustior	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sphyradium edentulum	33	34	...	36	37	38	39	...	41	...	...	...	...	46	47	48	49	50	51	52
S. minutissimum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Clausiliidæ																				
Balea perversa	33	34	35	36	...	38	39	40	41	42	43	...	45	46	...	48	49	50	51	52
Clausilia laminata	33	34	35	36	37	38	39	40	41	...	...	...	...	...	...	...	...	50	...	...
C. biplicata	*33*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

ENGLAND.

	Trent.			Mersey.			Humber.					Tyne.			Lakes.			NAME OF SPECIES.
	55 Leicester	56 Nottingham	57 Derby	58 Cheshire	59 Lancashire S.	60 Lancashire W.	61 York S.E.	62 York N.E.	63 York S.W.	64 York Mid W.	65 York N.W.	66 Durham	67 Northumb. S.	68 Cheviotland	69 Westmorland	70 Cumberland	71 Isle of Man	Records in italics require confirmation.
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	T. cartusiana
…	…	56	…	…	59	60	61	62	63	64	65	66	67	68	69	70	…	Ashfordia granulata
…	…	…	57	58	59	…	…	62	63	64	…	66	67	68	69	70	71	Hygromia fusca
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. hispida
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. striolata
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	H. umbrosa
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	H. limbata
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	H. revelata
4	55	56	57	58	59	60	…	62	63	64	65	66	67	68	66	70	…	Acanthinula aculeata
…	…	…	57	58	…	…	…	62	63	64	…	66	*67*	68	69	70	…	A. lamellata
…	…	56	57	58	59	…	61	62	63	64	65	66	…	68	69	…	71	Vallonia pulchella agg.
4	…	56	…	58	…	60	…	…	63	…	…	…	67	…	…	70	71	V. pulchella seg.
4	55	…	…	58	59	60	…	…	63	64	…	…	…	…	69	70	71	V. excentrica
4	55	56	57	…	…	60	61	62	63	64	65	66	67	68	69	70	…	V. costata
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Helicodonta obvoluta
4	55	56	57	…	…	…	61	62	63	64	65	…	…	…	…	…	…	Helicigona lapicida
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	…	Arianta arbustorum
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Helix pomatia
4	55	56	57	58	59	60	61	62	63	64	65	66	67	66	69	70	71	H. aspersa
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. nemoralis
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	H. hortensis
…	…	…	…	…	…	…	…	*62*	…	…	…	…	…	…	…	…	…	Euparypha pisana
																		Buliminidæ
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Ena montana
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	…	E. obscura
																		Stenogyridæ
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Cochlicopa lubrica
4	…	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	…	Azeca tridens
4	55	56	57	…	…	60	…	62	63	64	…	66	67	…	69	…	71	Cæcilioides acicula
																		Pupidæ
4	…	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Pupa marginata
4	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	P. umbilicata
4	…	56	…	58	59	…	61	62	…	64	…	66	67	…	69	70	71	P. anglica
4	…	…	57	…	…	…	…	…	…	64	65	…	…	…	69	70	…	P. secale
4	…	56	57	58	59	60	61	62	63	64	…	…	…	…	69	70	71	Vertigo antivertigo
…	…	…	57	58	59	60	…	62	63	64	…	66	…	…	69	70	71	V. substriata
4	…	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	V. pygmæa
…	…	*56*	*57*	…	…	…	…	…	…	…	…	…	…	…	…	…	…	V. moulinsiana
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	V. lilljeborgi
…	…	…	…	…	…	60	…	…	63	64	…	…	67	…	69	70	…	V. alpestris
…	…	*56*	*57*	…	…	60	…	62	63	64	…	66	67	68	69	70	…	V. pusilla
4	…	*56*	*57*	…	…	…	…	…	63	*64*	…	…	…	…	…	…	…	V. angustior
4	…	56	57	58	59	60	…	62	63	64	…	66	*67*	68	69	70	71	Sphyradium edentulum
4	…	…	…	…	…	…	61	…	63	…	…	66	…	…	…	…	…	S. minutissimum
																		Clausiliidæ
4	55	56	57	58	59	60	61	62	…	64	65	66	67	68	69	70	71	Balea perversa
4	…	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	…	Clausilia laminata
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	C. biplicata

NAME OF SPECIES.	ENGLAND AND WALES.																				
	Severn.								**South Wales.**						**North Wales.**						
Records in italics require confirmation.	33 Gloucester E.	34 Gloucester W.	35 Monmouth	36 Hereford	37 Worcester	38 Warwick	39 Stafford	40 Salop	41 Glamorgan	42 Brecon	43 Radnor	44 Carmarthen	45 Pembroke	46 Cardigan	47 Montgomery	48 Merioneth	49 Carnarvon	50 Denbigh	51 Flint	52 Anglesea
C. cravenensis ...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C. bidentata ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
C. rolphii	33	...	35	...	...	...	...	40	...	...	...	...	...	...	...	...	...	...	...	...
Succineidæ																				
Succinea putris ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
S. elegans	33	34	35	36	37	38	39	40	41	...	43	...	45	46	47	48	49	50	51	52
S. oblonga ...	...	...	...	...	...	...	...	...	41	...	...	...	...	...	...	48	...	...	...	...
Auriculidæ																				
Carychium minimum	33	34	35	36	37	38	39	...	41	42	43	44	45	46	47	48	49	50	51	52
Phytia myosotis ...	...	34	35	...	...	...	...	...	41	...	...	..	45	...	...	...	...	...	...	...
Ovatella bidentata ...	...	34	...	...	...	...	..	...	...	...	...	...	45	..	...	...	...	...	...	...
Ancylidæ																				
Ancylus fluviatilis ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
A. lacustris ...	33	34	35	36	37	38	39	40	41	42	43	...	45	.	47	...	...	...	...	52
Limnæidæ																				
Limnæa auricularia ...	33	34	35	36	37	38	39	40	41	42	..	44	...	...	47	...	...	...	...	52
L. peregra ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
L. burnetti... ...	...	...	...	...	...	...	...	...	...	...	...	44	...	..	...	...	...	...	...	...
L. prætenuis ...	...	...	...	...	...	...	...	...	...	..	..	...	...	...	...	...	...	...	...	...
L. involuta ...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...
L. palustris ...	33	34	35	36	37	38	39	40	41	42	43	44	45	...	47	...	49	...	51	52
L. truncatula ..	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
L. stagnalis ...	33	34	...	36	37	38	39	40	41	42	43	...	45	...	47	...	...	...	...	52
L. glabra ...	...	...	...	...	37	...	39	40	...	...	...	...	...	...	47	48	...	...	...	...
Amphipeplea glutinosa	33	34	...	...	...	38	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Planorbidæ																				
Planorbis corneus ...	33	34	35	36	37	38	39	...	41	...	...	...	...	...	...	...	...	...	...	...
P. albus ...	33	34	35	36	37	38	39	40	41	42	43	44	45	...	47	...	49	50	51	52
P. glaber ...	...	...	...	...	37	38	...	...	...	42	...	...	...	...	...	...	49	...	...	...
P. nautileus ...	33	...	35	36	37	38	39	40	41	42	...	...	45	46	47	..	49	...	51	52
P. dilatatus ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
P. carinatus ...	33	34	35	...	37	38	39	...	41	42	...	...	...	...	47	...	...	...	...	...
P. complanatus ...	33	34	35	36	37	38	39	40	41	42	.	...	...	...	47	...	...	...	...	52
P. vortex ...	33	34	...	36	37	38	39	40	41	42	...	...	...	...	47	...	...	...	...	...
P. leucostoma ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Bathyomph. contortus	33	34	...	36	37	38	39	40	41	42	43	...	...	...	...	48	49	...	51	52
Hippeutis fontanus ...	33	34	...	36	37	38	39	40	41	42	43	44	45	...	47	...	49	...	...	52
Segmentina nitida ...	...	...	...	...	37	...	...	...	41	..	...	...	...	...	47	...	...	...	...	...
Physidæ																				
Physa fontinalis ...	33	34	35	36	37	38	39	40	41	42	43	44	45	...	47	48	49	50	51	52
P. heterostropha ...	...	34	...	...	...	...	...	...	41	...	...	...	...	...	...	...	...	...	...	...
Aplexa hypnorum ...	33	34	35	36	37	38	39	40	41	42	...	...	45	...	...	...	49	50	51	52
Paludestrinidæ																				
Paludestrina ventrosa	...	...	..	...	...	...	...	...	41	...	...	...	...	..	...	...	...	...	...	...
P. jenkinsi ...	33	...	35	...	37	38	39	...	41	42	..	44	...	...	...	48	...	...	...	...
P. stagnalis ...	...	...	...	...	...	...	...	...	41	...	...	...	45	46	...	...	...	...	...	52
P. confusa ...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amnicola taylori ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bithynia tentaculata...	33	34	35	36	37	38	39	40	41	42	43	...	...	...	47	...	...	...	...	...

ENGLAND.

Trent.					Mersey.			Humber.					Tyne.			Lakes.			NAME OF SPECIES.
:	54 Lincoln N.	55 Leicester	56 Nottingham	57 Derby	58 Cheshire	59 Lancashire S.	60 Lancashire W.	61 York S.E.	62 York N.E.	63 York S.W.	64 York Mid W.	65 York N.W.	66 Durham	67 Northumb. S.	68 Cheviotland	69 Westmorland	70 Cumberland	71 Isle of Man	Records in italics require confirmation.
.	…	…	…	…	…	…	60	…	*62*	63	64	65	66	…	…	69	70	…	C. cravenensis
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	C. bidentata
3	54	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	C. rolphii
																			Succineidæ
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	71	Succinea putris
3	54	55	56	57	58	59	60	61	62	63	64	65	…	67	68	69	70	71	S. elegans
.	…	…	…	…	…	…	60	…	62	…	…	…	…	…	…	69	…	…	S. oblonga
																			Auriculidæ
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Carychium minimum
.	54	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Phytia myosotis
.	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Ovatella bidentata
																			Ancylidæ
3	…	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Ancylus fluviatilis
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	…	A. lacustris
																			Limnæidæ
3	54	55	56	57	58	59	60	61	62	63	64	…	66	67	68	69	70	…	Limnæa auricularia
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	L. peregra
.	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	L. burnetti
.	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	L. prætenuis
.	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	L. involuta
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	71	L. palustris
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	L. truncatula
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	*68*	…	…	…	L. stagnalis
3	54	…	…	…	58	59	…	61	62	63	64	65	66	67	…	69	70	…	L. glabra
.	54	…	…	…	…	…	…	61	62	…	…	…	…	…	…	69	…	…	Amphipeplea glutinosa
																			Planorbidæ
3	54	55	56	57	58	59	…	61	62	63	64	65	…	…	…	…	…	…	Planorbis corneus
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	P. albus
3	…	55	56	57	…	59	…	…	62	63	64	65	66	67	68	…	70	…	P. glaber
3	54	…	56	57	58	59	60	61	62	63	64	65	66	67	…	…	70	71	P. nautileus
.	…	…	…	…	58	59	…	…	…	…	…	…	…	…	…	…	…	…	P. dilatatus
3	54	55	56	37	58	59	60	61	62	63	64	65	66	…	…	69	70	…	P. carinatus
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	…	P. complanatus
3	54	55	56	57	58	59	60	61	62	63	64	…	66	…	…	…	70	71	P. vortex
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	71	P. leucostoma
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	71	Bathyomph. contortus
3	54	55	56	…	58	59	60	61	62	63	64	…	66	67	…	…	70	…	Hippeutis fontanus
3	54	…	56	…	…	59	60	61	…	63	64	…	…	…	…	…	…	…	Segmentina nitida
																			Physidæ
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	Physa fontinalis
.	…	…	…	…	58	59	…	…	…	…	…	…	…	…	…	…	…	…	P. heterostropha
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	71	Aplexa hypnorum
																			Paludestrinidæ
.	54	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Paludestrina ventrosa
.	54	55	56	…	58	59	…	61	62	63	64	…	…	…	…	…	70	…	P. jenkinsi
.	54	…	…	…	…	59	60	…	…	…	…	…	…	67	68	69	70	…	P. stagnalis
.	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	P. confusa
.	…	…	…	…	58	59	…	…	…	…	…	…	…	…	…	…	…	…	Amnicola taylori
3	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	…	Bithynia tentaculata

NAME OF SPECIES.	ENGLAND AND WALES.																			
	Severn.								South Wales.						North Wales.					
Records in italics require confirmation.	33 Gloucester E.	34 Gloucester W.	35 Monmouth	36 Hereford	37 Worcester	38 Warwick	39 Stafford	40 Salop	41 Glamorgan	42 Brecon	43 Radnor	44 Carmarthen	45 Pembroke	46 Cardigan	47 Montgomery	48 Merioneth	49 Carnarvon	50 Denbigh	51 Flint	52 Anglesea
B. leachii ...	33	34	...	...	...	38	39	40	41	...	...	...	45	...	...	...	...	...	...	...
Viviparidæ																				
Paludina contecta ...	33	34	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
P. vivipara ...	33	34	35	36	37	38	39	40	41	42	...	...	...	...	47	..	...	...	...	...
Valvatidæ																				
Valvata piscinalis	33	34	35	36	37	38	39	40	41	42	43	...	45	...	47	48	...	...	51	52
V. macrostoma ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...
V. cristata ...	33	34	...	36	37	...	39	...	41	42	43	..	45	...	47	..	...	50	..	52
Assemaniidæ																				
Assemania grayana ...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pomatiidæ																				
Cyclostoma elegans ...	33	34	35	36	...	38	...	...	41	...	...	44	45	...	...	...	...	50	51	...
Aciculidæ																				
Acme lineata ...	33	...	...	...	...	...	...	...	41	..	43	44	45	...	...	48	...	...	...	52
Neritidæ																				
Neritina fluviatilis ...	33	34	35	36	37	38	39	40	...	...	...	...	...	...	...	...	...	...	...	...
Dreissenidæ																				
Dreissena polymorpha	33	34	...	36	37	38	39	40	...	...	...	...	...	...	...	...	...	...	...	..
Unionidæ																				
Unio pictorum ...	33	34	...	36	37	38	39	40	...	42	...	...	...	...	47	...	...	...	...	...
U. tumidus ...	33	34	..	36	37	38	39	40	..	...	...	...	...	...	47	...	...	...	...	...
Marg. margaritifera ...	...	34	35	36	...	...	...	...	...	..	...	44	45	...	...	48	49	50	...	...
Anodonta cygnea ...	33	34	35	36	37	38	39	40	41	42	...	...	45	...	47	...	...	...	...	52
A. anatina ...	33	34	35	36	37	38	39	40	...	42	43	...	45	...	...	...	49	...	...	52
Pseudanodonta sp. ...	...	...	...	...	37	38	39	...	...	...	...	...	...	...	...	...	...	...	...	...
Cyrenidæ																				
Sphærium rivicola ...	33	34	...	...	37	38	39	40	...	42	...	...	...	...	47	...	...	...	...	...
S. corneum ...	33	34	35	36	37	38	39	40	41	42	43	44	45	...	47	48	49	50	...	52
S. lacustre ...	33	34	...	36	37	38	39	40	41	42	43	44	45	...	47	48	49	50	51	52
S. pallidum ...	33	34	...	...	37	38	39	...	...	...	...	...	...	...	47	...	...	...	...	...
Pisidium amnicum ...	33	34	35	36	37	38	39	40	41	42	...	...	45	...	47	...	...	50	...	...
P. casertanum ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
P. henslowanum ..	33	34	35	36	37	38	39	...	...	42	...	...	...	...	47	.	...	...	...	...
P. hibernicum ...	33	34	..	...	37	38	39	...	41	42	...	...	...	...	47	48	49	50	...	52
P. lilljeborgi ...	...	...	...	..	...	...	...	...	...	.	...	...	...	...	47	...	49	...	...	...
P. milium ...	33	34	...	36	37	38	39	...	41	42	43	44	45	...	47	48	49	50	51	52
P. nitidum ...	33	34	35	36	37	38	39	40	41	42	43	..	45	46	47	48	..	...	..	52
P. obtusale ...	33	34	..	36	37	38	39	40	41	42	43	...	45	46	47	48	49	50	51	52
P. parvulum ...	...	...	...	36	37	...	...	...	...	...	...	...	...	...	47	...	...	...	...	...
P. personatum ...	33	34	...	36	37	38	39	40	41	42	43	44	...	...	47	48	...	...	51	...
P. pulchellum ...	...	34	...	36	...	38	...	...	...	...	...	...	...	...	...	...	...	...	...	52
P. subtruncatum ...	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	...	50	51	52
P. supinum ...	..	...	...	36	37	...	39	40	...	...	...	..	...	...	...	...	...	...	...	...
P. tenuilineatum ...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...
Total species 163	103	112	82	99	105	105	107	82	109	86	69	63	86	53	77	72	79	76	68	84

ENGLAND.																			Name of Species.
Trent.					Mersey.			Humber.					Tyne.			Lakes.			
53 Lincoln S.	54 Lincoln N.	55 Leicester	56 Nottingham	57 Derby	58 Cheshire	59 Lancashire S.	60 Lancashire W.	61 York S.E.	62 York N.E.	63 York S.W.	64 York Mid W.	65 York N.W.	66 Durham	67 Northumb. S.	68 Cheviotland	69 Westmorland	70 Cumberland	71 Isle of Man	Records in italics require confirmation.
53	54	55	56	57	…	59	…	61	62	63	64	…	…	…	…	…	…	…	B. leachii
																			Viviparidæ
53	54	55	56	…	58	59	…	61	*62*	63	64	…	…	…	…	…	…	…	Paludina contecta
53	54	55	56	57	58	59	…	61	62	63	64	…	…	…	…	…	…	…	P. vivipara
																			Valvatidæ
53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	…	69	70	71	Valvata piscinalis
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	V. macrostoma
53	54	…	56	57	58	59	60	61	…	63	64	…	66	67	…	69	70	…	V. cristata
																			Assemaniidæ
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Assemania grayana
																			Pomatiidæ
53	54	…	…	…	…	…	60	…	62	…	64	…	…	…	…	69	…	…	Cyclostoma elegans
																			Aciculidæ
…	…	…	…	57	…	…	60	…	62	63	64	…	66	…	…	69	…	71	Acme lineata
																			Neritidæ
53	54	55	56	57	…	…	60	61	62	63	64	65	…	…	…	69	…	…	Neritina fluviatilis
																			Dreissenidæ
53	54	55	56	57	58	59	60	…	62	63	64	…	…	…	…	…	…	…	Dreissena polymorpha
																			Unionidæ
53	54	55	56	57	58	59	…	…	62	63	64	…	…	…	68	…	…	…	Unio pictorum
53	54	55	56	57	58	59	…	61	62	63	64	…	…	…	…	…	…	…	U. tumidus
…	…	…	…	…	…	…	60	…	62	…	…	…	…	67	…	69	70	71	Marg. margaritifera
53	54	55	56	57	58	59	60	61	62	63	64	65	66	*67*	…	…	70	…	Anodonta cygnea
…	54	55	56	…	58	59	60	61	62	63	64	65	66	67	68	…	70	…	A. anatina
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	Pseudanodonta sp.
																			Cyrenidæ
53	54	55	56	57	58	59	…	…	62	63	64	…	…	*67*	…	…	…	…	Sphærium rivicola
53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	S. corneum
53	54	55	56	57	58	59	60	61	62	63	64	…	66	67	68	69	70	…	S. lacustre
…	…	…	…	…	58	59	…	…	62	63	64	…	…	…	…	…	…	…	S. pallidum
53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	…	Pisidium amnicum
53	…	55	56	57	58	59	60	…	62	63	64	…	66	67	68	69	70	71	P. casertanum
53	54	55	56	…	58	59	60	…	62	63	64	…	66	…	68	…	…	…	P. henslowanum
53	54	…	…	…	58	…	60	…	62	…	64	…	…	…	…	69	70	71	P. hibernicum
…	…	…	…	…	…	…	60	…	…	…	64	…	…	…	…	69	70	…	P. lilljeborgi
53	54	55	56	57	58	59	60	…	62	63	…	…	66	…	68	69	70	71	P. milium
53	54	55	56	57	58	59	60	61	62	63	64	…	…	67	68	69	70	71	P. nitidum
53	54	55	…	…	58	59	60	61	62	63	64	…	66	67	68	69	70	…	P. obtusale
…	…	…	…	…	58	…	…	…	…	…	64	…	…	…	…	…	…	…	P. parvulum
…	54	55	…	57	58	59	60	61	62	63	64	…	66	67	68	…	70	…	P. personatum
53	54	…	56	…	58	…	60	…	62	…	…	…	…	…	…	69	70	…	P. pulchellum
53	54	55	56	57	58	59	60	61	62	63	64	…	…	67	68	69	70	71	P. subtruncatum
53	…	…	56	…	58	59	…	…	…	63	64	…	…	…	…	…	…	…	P. supinum
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	P. tenuilineatum
103	112	85	101	96	109	108	103	96	114	117	117	77	91	88	69	98	100	71	*Total species* 163

NAME OF SPECIES.	SCOTLAND.																				
	W. Lowlands.						E. Lowlands.							East High							
Records in italics require confirmation.	72 Dumfries	73 Kirkcudbright	74 Wigtown	75 Ayr	76 Renfrew	77 Lanark	78 Peebles	79 Selkirk	80 Roxburgh	81 Berwick	82 Haddington	83 Edinburgh	84 Linlithgow	85 Fife & Kinross	86 Stirling	87 PerthW. & Cl.	88 Perth Mid	89 Perth E.*	90 Forfar	91 Kincardine	92 Aberdeen S.
Testacellidæ	...																				
Testacella maugei ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
T. haliotidea ...	...	73	...	...	...	77	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
T. scutulum ...		...	...	...	76	...	...	...	...	...	...	...	...	85	86	...	88	...	...	...	...
Limacidæ	...																				
Limax maximus ...		73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
L. cinereoniger ...	...	...	...	...	...	...	...	...	...	...	...	83	...	...	...	87	88	...	90	...	92
L. tenellus ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	87	88	89	...	91	...
L. flavus ...	...	73	...	...	76	77	...	...	...	81	...	83	...	85	...	...	...	...	...	...	...
L. arborum ...	...	73	74	...	76	...	78	79	80	81	82	83	...	85	86	87	88	89	90	91	92
Agriolimax agrestis ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
A. lævis ...	72	...	...	...	76	77	78	...	...	81	82	83	84	85	...	87	88	89	...	...	92
Milax sowerbyi ...	...	...	...	...	76	...	...	79	...	81	...	83	...	85	...	87	...	...	...	...	92
M. gagates ...	...	73	74	...	...	...	...	...	...	81	...	83	...	...	86	87	...	...	...	...	...
Zonitidæ																					
Vitrina pellucida	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
V. pyrenaica ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hyalinia crystallina ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
H. lucida ...	...	...	...	...	76	77	...	...	...	...	...	...	...	85	86	...	88	89	...	*91*	...
H. cellaria ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
H. rogersi ...	72	...	...	75	...	...	...	...	80	...	...	...	...	...	86	...	...	...	...	...	92
H. alliaria ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
H. nitidula ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
H. pura ...	72	73	...	75	76	...	...	79	80	81	82	83	84	85	86	87	88	89	90	91	92
H. radiatula ...	72	73	74	75	76	77	78	...	80	...	82	83	84	85	86	87	88	89	90	91	92
Euconulus fulvus ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Zonitoides nitidus ...	...	73	74	75	...	...	...	...	80	81	...	...	...	...	86	87	...	89	...	...	...
Z. excavatus ...	72	73	74	75	76	77	...	...	...	...	...	...	84	...	86	87	88	...	...	...	...
Arionidæ																					
Arion ater ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
A. subfuscus ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	...	91	92
A. minimus ...	72	73	74	75	...	77	78	79	...	81	82	83	84	85	86	87	88	89	...	91	92
A. hortensis ..	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
A. circumscriptus ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Geomalacus maculosus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Helicidæ																					
Punctum pygmæum ...	...	73	...	75	...	77	78	...	80	81	82	83	84	85	86	87	88	89	...	...	92
Pyramidula rupestris ...	...	...	...	...	...	...	...	...	...	...	...	83	...	...	...	...	...	89	...	...	...
P. rotundata ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Eulota fruticum ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Helicella virgata ...	...	73	...	75	...	...	...	...	...	...	*82*	...	...	*85*	...	*87*	...	...	...	...	...
H. itala ...	...	...	...	75	...	...	...	...	...	...	...	...	...	85	...	...	...	...	...	...	...
H. caperata agg. ...	...	...	74	75	76	77	78	79	80	81	82	83	84	85	86	...	...	...	90	...	92
H. caperata seg. ...	...	...	74	...	...	...	...	...	...	...	...	...	...	85	...	...	...	...	90	...	92
H. heripensis ...	...	...	...	...	...	...	...	...	...	...	*82*	...	...	...	...	...	...	...	...	...	...
H. neglecta ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trochula elegans ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cochlicella barbara ...	...	73	74	75	...	...	...	...	...	...	...	*83*	...	...	...	...	...	...	...	...	...
Theba cantiana ...	...	...	...	...	...	...	...	...	...	...	...	...	...	*85*	...	...	...	...	...	...	...

SCOTLAND.																			
ıds.			West Highlands.							N. Highlands.						Isles.			NAME OF SPECIES.
	95 Elgin	96 Easterness	97 Westerness	98 Main Argyle	99 Dumbarton	100 Clyde Isles	101 Cantire	102 Ebudes S.	103 Ebudes Mid.	104 Ebudes N.	105 Ross W.	106 Ross E.	107 Sutherland E.	108 Sutherland W.	109 Caithness	110 Hebrides	111 Orkney	112 Shetland	Records in italics require confirmation.
																			Testacellidæ
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Testacella maugei
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	T. haliotidea
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	T. scutulum
																			Limacidæ
4	95	96	97	98	99	00	01	02	...	04	...	06	07	...	09	...	11	12	Limax maximus
4	95	96	97	...	...	00	01	...	...	...	05	...	07	...	...	...	...	...	L. cinereoniger
.	...	96	...	...	...	...	...	02	...	...	...	...	...	...	...	...	...	...	L. tenellus
.	95	...	...	...	...	00	...	...	...	...	...	...	...	...	09	...	...	...	L. flavus
4	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	L. arborum
4	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	Agriolimax agrestis
4	95	96	97	98	99	00	01	...	...	...	05	06	07	08	09	...	11	...	A. lævis
.	...	...	...	98	...	00	...	...	...	...	...	...	...	...	...	...	...	...	Milax sowerbyi
.	...	...	...	...	99	00	...	...	...	...	05	...	...	...	...	...	11	...	M. gagates
																			Zonitidæ
4	95	96	97	98	99	00	01	...	03	04	05	06	07	08	09	10	11	...	Vitrina pellucida
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. pyrenaica
4	95	96	97	98	99	00	01	02	03	04	05	...	07	...	09	10	11	...	Hyalinia crystallina
.	...	...	...	98	...	00	...	...	...	...	...	...	...	...	...	10	...	...	H. lucida
4	95	96	97	98	99	00	01	02	03	04	05	06	07	...	09	10	11	12	H. cellaria
4	...	...	...	98	99	00	...	...	...	...	...	...	...	...	...	...	...	...	H. rogersi
4	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	H. alliaria
4	95	...	97	98	99	00	01	02	03	04	05	06	...	...	09	10	...	...	H. nitidula
4	95	96	97	98	99	00	01	...	...	04	05	...	07	...	09	...	11	12	H. pura
4	95	96	97	98	99	00	01	02	...	04	05	06	...	...	09	10	11	...	H. radiatula
4	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	...	11	...	Euconulus fulvus
4	...	96	...	98	...	00	...	...	03	...	05	...	...	...	...	10	...	...	Zonitoides nitidus
.	...	...	...	98	99	00	01	...	...	...	05	...	...	...	...	...	...	...	Z. excavatus
																			Arionidæ
4	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	Arion ater
4	95	96	97	98	99	00	01	02	...	04	05	06	07	...	09	10	...	...	A. subfuscus
4	95	96	97	98	...	00	01	02	...	04	05	06	07	...	...	10	11	...	A. minimus
4	95	96	97	98	99	00	01	02	...	04	05	06	07	08	09	...	11	...	A. hortensis
4	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	A. circumscriptus
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Geomalacus maculosus
																			Helicidæ
4	...	96	97	98	99	00	01	...	...	04	05	...	07	08	09	10	11	...	Punctum pygmæum
.	...	...	...	98	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Pyramidula rupestris
4	95	...	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	P. rotundata
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Eulota fruticum
.	...	...	...	...	...	...	...	02	...	...	...	...	...	...	...	...	...	...	Helicella virgata
.	...	...	97	98	...	00	01	02	03	04	*05*	...	*07*	08	09	10	...	...	H. itala
.	95	...	...	98	99	00	01	...	...	...	...	...	07	08	...	10	...	...	H. caperata agg.
.	...	96	...	98	...	...	...	...	...	...	...	06	...	...	...	...	...	...	H. caperata seg.
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. heripensis
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. neglecta
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Trochula elegans
.	...	...	...	...	...	00	01	02	03	04	...	...	...	08	09	10	...	...	Cochlicella barbara
.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Theba cantiana

NAME OF SPECIES.	SCOTLAND.																				
	W. Lowlands.						E. Lowlands.							East High							
Records in italics require confirmation.	72 Dumfries	73 Kirkcudbright	74 Wigtown	75 Ayr	76 Renfrew	77 Lanark	78 Peebles	79 Selkirk	80 Roxburgh	81 Berwick	82 Haddington	83 Edinburgh	84 Linlithgow	85 Fife & Kinross	86 Stirling	87 PerthW. & Cl.	88 Perth Mid	89 Perth E.	90 Forfar	91 Kincardine	92 Aberdeen S.
T. cartusiana ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashfordia granulata ...	...	...	...	75	76	...	...	...	80	81	82	83	...	...	...	...	...	89	90	91	...
Hygromia fusca ...	72	73	...	75	76	77	78	...	80	81	82	83	84	...	...	87	88	89	90	...	92
H. hispida ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	...
H. striolata ...	...	73	74	75	76	77	...	79	80	...	...	...	...	85	86	87	...	89	...	...	...
H. umbrosa ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. limbata ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. revelata ..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Acanthinula aculeata	72	73	74	75	76	...	...	79	80	81	82	83	...	85	86	87	88	89	90	...	92
A. lamellata ...	72	73	...	75	...	...	...	...	...	...	82	83	...	...	86	87	88	89	...	...	...
Vallonia pulchella agg.	...	...	...	...	...	...	78	...	...	81	82	83	...	85	86	87	88	89	90	91	...
V. pulchella seg. ...	...	...	74	75	...	...	...	...	80	...	...	...	84	...	...	...	...	...	90	...	92
V. excentrica ...	...	...	...	...	76	...	...	...	80	...	...	...	84	...	86	...	...	...	...	...	...
V. costata ...	...	...	...	...	...	...	...	...	...	81	82	...	84	...	...	...	88	89	90	91	92
Helicodonta obvoluta	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Helicigona lapicida ...	...	...	...	...	...	...	...	...	80	...	...	...	...	...	...	...	...	...	...	...	...
Arianta arbustorum ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Helix pomatia ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. aspersa ...	72	73	74	75	76	...	78	79	80	81	82	83	84	85	86	87	88	89	90	...	92
H. nemoralis ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	...
H. hortensis ...	...	73	...	75	76	77	...	79	80	81	82	83	...	85	86	87	88	89	90	91	92
Euparypha pisana ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Buliminidæ																					
Ena montana ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
E. obscura ...	...	...	...	...	...	77	...	79	80	81	82	83	84	85	86	...	88	89	90	91	...
Stenogyridæ																					
Cochlicopa lubrica ..	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Azeca tridens ..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cæcilioides acicula ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pupidæ																					
Pupa marginata ...	...	...	...	75	...	...	...	...	...	...	82	83	...	85	...	...	...	...	...	91	...
P. umbilicata ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
P. anglica ...	...	...	74	75	76	...	...	...	...	81	...	83	84	...	...	87	88	...	...	91	...
P. secale ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vertigo antivertigo ...	...	...	...	...	...	...	...	...	80	81	82	83	...	...	...	...	...	89	...	...	...
V. substriata ...	72	73	...	75	...	...	78	...	80	...	...	83	...	85	...	87	88	...	...	...	92
V. pygmæa ...	72	73	74	75	76	77	78	79	...	81	82	83	84	85	86	87	88	89	90	91	...
V. moulinsiana ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. lilljeborgi ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. alpestris ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. pusilla ...	72	73	...	75	...	...	...	...	...	...	...	...	...	...	...	87	...	...	...	...	...
V. angustior ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sphyradium edentulum	72	73	74	...	76	...	78	...	80	81	82	83	84	85	86	87	88	89	90	91	...
S. minutissimum ..	...	...	...	...	...	...	...	...	...	...	82	83	...	...	...	...	...	...	...	...	...
Clausiliidæ																					
Balea perversa ..	...	73	74	75	76	...	...	79	80	81	82	83	...	85	86	87	88	89	...	91	...
Clausilia laminata ...	...	...	...	...	...	...	...	...	...	...	...	...	...	85	...	...	...	89	...	91	...
C. biplicata ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

SCOTLAND.																				NAME OF SPECIES.
lands.				West Highlands.							N. Highlands.						Isles.			Records in italics require confirmation.
[illegible] Aberdeen N.	94 Banff	95 Elgin	96 Easterness	97 Westerness	98 Main Argyle	99 Dumbarton	100 Clyde Isles	101 Cantire	102 Ebudes S.	103 Ebudes Mid.	104 Ebudes N.	105 Ross W.	106 Ross E.	107 Sutherland E.	108 Sutherland W.	109 Caithness	110 Hebrides	111 Orkney	112 Shetland	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	T. cartusiana
...	94	95	...	...	98	...	00	01	02	03	04	...	...	...	...	...	10	...	...	Ashfordia granulata
...	94	95	...	97	98	99	00	01	...	...	04	...	06	07	...	...	...	...	...	Hygromia fusca
...	...	...	...	...	98	99	00	01	02	...	...	...	...	...	...	...	...	11	...	H. hispida
...	...	...	...	...	98	99	...	01	...	...	...	...	...	*07*	...	...	...	...	...	H. striolata
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. umbrosa
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. limbata
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. revelata
...	94	95	...	...	98	99	...	...	...	...	...	05	...	07	...	09	...	...	...	Acanthinula aculeata
...	94	95	...	97	98	*99*	00	01	...	...	04	05	06	07	...	...	...	...	...	A. lamellata
...	...	95	96	...	98	...	00	01	...	...	04	...	...	07	...	...	...	...	...	Vallonia pulchella agg.
93	94	...	...	...	...	...	00	01	...	...	...	...	...	...	...	...	10	11	...	V. pulchella seg.
...	...	...	...	...	...	...	...	...	02	03	...	...	...	...	...	...	...	11	...	V. excentrica
...	...	...	...	...	...	...	...	...	02	...	...	...	...	...	...	...	...	...	...	V. costata
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Helicodonta obvoluta
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Helicigona lapicida
93	94	95	...	97	98	99	00	01	02	03	04	05	06	07	08	09	...	11	12	Arianta arbustorum
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Helix pomatia
...	94	95	...	97	98	99	00	01	02	03	04	...	...	...	...	...	10	...	...	H. aspersa
...	...	...	...	97	98	99	00	01	02	03	04	...	...	...	...	...	...	...	...	H. nemoralis
93	94	95	96	97	98	99	00	...	02	03	04	05	06	07	08	09	10	11	12	H. hortensis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Euparypha pisana
																				Buliminidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Ena montana
...	94	95	...	...	...	99	...	...	...	...	...	...	...	...	...	...	...	...	...	E. obscura
																				Stenogyridæ
93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	Cochlicopa lubrica
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Azeca tridens
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Cæcilioides acicula
																				Pupidæ
...	...	95	...	...	98	...	00	...	...	...	...	...	...	07	08	...	...	...	12	Pupa marginata
93	94	95	...	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	P. umbilicata
...	94	...	...	97	98	...	00	01	...	...	04	05	06	07	08	...	10	11	...	P. anglica
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. secale
...	...	95	...	97	98	...	00	...	...	...	...	...	06	07	...	...	...	...	...	Vertigo antivertigo
...	94	...	...	97	98	...	00	...	...	...	04	05	...	07	...	...	10	...	...	V. substriata
...	94	95	...	...	98	...	00	01	...	...	...	05	...	07	...	09	...	...	...	V. pygmæa
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. moulinsiana
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. lilljeborgi
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. alpestris
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. pusilla
...	...	...	...	...	...	...	...	...	...	...	...	...	...	07	...	...	...	...	...	V. angustior
[illegible]	94	95	...	97	98	99	00	01	02	...	04	05	...	07	08	09	10	...	...	Sphyradium edentulum
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	S. minutissimum
																				Clausiliidæ
[illegible]	94	95	...	97	98	99	00	01	02	03	04	05	...	07	...	09	10	11	12	Balea perversa
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Clausilia laminata
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	C. biplicata

Name of Species.	SCOTLAND.																				
	W. Lowlands.						E. Lowlands.							East High							
Records in italics require confirmation.	72 Dumfries	73 Kirkcudbright	74 Wigtown	75 Ayr	76 Renfrew	77 Lanark	78 Peebles	79 Selkirk	80 Roxburgh	81 Berwick	82 Haddington	83 Edinburgh	84 Linlithgow	85 Fife & Kinross	86 Stirling	87 PerthW. & Cl.	88 Perth Mid	89 Perth E.	90 Forfar	91 Kincardine	92 Aberdeen S.
C. cravenensis ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C. bidentata ...	72	73	74	75	76	77	...	79	80	81	82	83	84	85	86	87	88	89	90	91	...
C. rolphii	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Succineidæ																					
Succinea putris ...	72	73	...	75	76	77	78	79	80	81	82	83	84	85	86	...	88	89	90	91	92
S. elegans	...	73	74	...	...	...	...	79	...	81	82	83	84	85	86	87	...	89	...	...	...
S. oblonga ...	...	...	...	75	...	...	...	...	...	...	...	...	84	...	...	87	...	...	...	...	...
Auriculidæ																					
Carychium minimum	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
Phytia myosotis ...	...	...	...	...	...	...	...	...	...	...	...	83	...	...	...	...	...	...	...	...	...
Ovatella bidentata ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ancylidæ																					
Ancylus fluviatilis ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	...	92
A. lacustris ...	...	73	...	...	...	77	...	79	...	...	82	83	...	85	...	87	88	89	90	...	...
Limnæidæ																					
Limnæa auricularia ...	...	73	...	...	76	77	...	...	80	81	82	83	...	85	...	...	...	...	...	...	...
L. peregra ...	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
L. burnetti... ...	72	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	89	...	...	...
L. prætenuis ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
L. involuta ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
L. palustris ...	72	73	74	75	76	77	...	79	80	...	82	83	84	85	86	87	88	89	90	...	...
L. truncatula ..	72	73	74	75	76	77	78	79	80	81	82	83	...	85	86	87	88	89	90	91	92
L. stagnalis ...	...	...	...	...	...	77	...	...	80	*81*	82	...	84	...	...	...	...	...	...	...	...
L. glabra ...	...	...	...	...	...	77	...	...	...	...	...	83	...	...	86	...	...	89	...	...	...
Amphipeplea glutinosa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Planorbidæ																					
Planorbis corneus ...	...	...	...	...	...	77	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
P. albus ...	72	73	74	...	76	77	...	79	80	81	82	83	84	85	86	87	88	89	90	...	92
P. glaber ...	...	...	...	...	...	...	...	...	80	81	82	83	...	85	86	87	...	...	90	...	...
P. nautileus ...	72	73	...	...	76	77	...	79	80	...	82	83	84	85	...	87	...	89	90	...	92
P. dilatatus ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
P. carinatus ...	...	73	...	...	...	...	...	...	...	...	...	83	...	...	...	...	...	...	...	...	...
P. complanatus ...	72	73	...	...	...	...	...	...	...	...	82	83	...	...	...	...	...	...	...	...	...
P. vortex ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	90	...	...
P. leucostoma ...	72	73	...	...	76	77	...	...	...	...	82	83	84	85	86	87	...	89	90	...	92
Bathyomph. contortus	72	73	74	...	76	77	78	79	80	81	82	83	...	85	86	87	88	89	90	...	92
Hippeutis fontanus ...	72	...	...	...	76	77	...	...	80	81	82	...	...	85	86	87	88	...	90	...	...
Segmentina nitida ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Physidæ																					
Physa fontinalis ...	72	73	74	...	76	77	78	...	80	81	82	83	84	85	86	87	88	89	90	...	...
P. heterostropha ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Aplexa hypnorum ..	...	...	...	...	...	...	...	...	...	81	82	...	...	...	86	87	88	89	...	...	...
Paludestrinidæ																					
Paludestrina ventrosa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
P. jenkinsi ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	88	...	...	...	...
P. stagnalis ...	...	...	...	...	...	...	...	...	...	...	...	83	...	...	...	...	...	...	...	...	...
P. confusa ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amnicola taylori ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bithynia tentaculata...	...	73	74	...	76	77	78	...	...	...	...	83	84	...	86	...	...	...	...	...	...

SCOTLAND.

lands.				West Highlands.							N. Highlands.						Isles.			NAME OF SPECIES.
93 Aberdeen N.	94 Banff	95 Elgin	96 Easterness	97 Westerness	98 Main Argyle	99 Dumbarton	100 Clyde Isles	101 Cantire	102 Ebudes S.	103 Ebudes Mid.	104 Ebudes N.	105 Ross W.	106 Ross E.	107 Sutherland E.	108 Sutherland W.	109 Caithness	110 Hebrides	111 Orkney	112 Shetland	Records in italics requir confirmation.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	C. cravenensis
93	94	95	...	97	98	99	00	01	02	03	04	05	...	07	08	09	10	11	...	C. bidentata
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	C. rolphii
																				Succineidæ
93	94	95	...	...	98	99	00	...	...	03	...	05	...	...	...	...	10	11	...	Succinea putris
93	94	...	...	...	98	99	00	...	...	03	...	05	...	...	...	...	...	11	...	S. elegans
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	S. oblonga
																				Auriculidæ
...	94	...	96	97	98	99	00	01	...	03	04	05	...	07	...	...	10	11	...	Carychium minimum
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Phytia myosotis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Ovatella bidentata
																				Ancylidæ
...	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	...	10	11	...	Ancylus fluviatilis
93	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A. lacustris
																				Limnæidæ
...	94	95	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Limnæa auricularia
93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	L. peregra
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	L. burnetti
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	L. prætenuis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	L. involuta
93	...	95	...	...	...	...	00	...	...	...	...	...	06	...	...	...	...	...	...	L. palustris
93	94	95	...	...	98	99	00	01	...	03	04	05	06	07	08	09	10	11	12	L. truncatula
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	L. stagnalis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	L. glabra
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Amphipeplea glutinos
																				Planorbidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Planorbis corneus
...	94	...	...	...	98	99	00	...	...	03	...	...	...	07	...	...	...	...	...	P. albus
...	*94*	95	...	...	98	...	...	...	...	...	...	...	...	...	08	...	10	...	12	P. glaber
93	94	95	96	...	...	...	00	...	...	...	...	05	...	07	...	...	10	11	12	P. nautileus
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. dilatatus
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. carinatus
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. complanatus
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	09	...	...	...	P. vortex
93	*94*	95	...	...	...	...	00	...	02	03	...	...	06	07	08	...	...	...	...	P. leucostoma
...	94	95	96	...	98	99	00	...	...	...	...	05	06	...	...	09	...	...	12	Bathyomph. contortu
...	...	95	...	...	...	...	...	...	...	...	...	...	06	...	...	...	...	...	...	Hippeutis fontanus
...	...	*95*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Segmentina nitida
																				Physidæ
...	...	...	...	...	98	...	00	...	...	...	...	...	...	...	...	...	...	...	...	Physa fontinalis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. heterostropha
...	...	95	...	...	...	...	...	...	...	03	...	...	...	...	...	...	...	...	...	Aplexa hypnorum
																				Paludestrinidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Paludestrina ventros
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. jenkinsi
...	...	...	...	...	98	99	00	...	...	...	...	05	06	...	...	...	...	...	...	P. stagnalis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. confusa
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Amnicola taylori
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Bithynia tentaculata

NAME OF SPECIES.	SCOTLAND.																				
	W. Lowlands.						**E. Lowlands.**							**East High**							
Records in italics require confirmation.	72 Dumfries	73 Kirkcudbright	74 Wigtown	75 Ayr	76 Renfrew	77 Lanark	78 Peebles	79 Selkirk	80 Roxburgh	81 Berwick	82 Haddington	83 Edinburgh	84 Linlithgow	85 Fife & Kinross	86 Stirling	87 Perth W. & Cl.	88 Perth Mid	89 Perth E.	90 Forfar	91 Kincardine	92 Aberdeen S.
B. leachii ...																					
Viviparidæ																					
Paludina contecta ...																					
P. vivipara ...												*83*									
Valvatidæ																					
Valvata piscinalis	72	73	74		76	77	78		80	81	82	83		85	86	87	88	89	90		92
V. macrostoma ...																					
V. cristata ...		73			76	77			80		82	83		85					90		
Assemaniidæ																					
Assemania grayana ...																					
Pomatiidæ																					
Cyclostoma elegans ...																					
Aciculidæ																					
Acme lineata ...		73			76																
Neritidæ																					
Neritina fluviatilis ...																					
Dreissenidæ																					
Dreissena polymorpha					76	77						83			86		88				
Unionidæ																					
Unio pictorum ...																					
U. tumidus ...																					
Marg. margaritifera ...	*72*		74	75	76	77									86	87	88	89	90	91	92
Anodonta cygnea ...		73			76				80		82	83		85	86		88	89	90		
A. anatina ...										81	82	83									
Pseudanodonta sp. ...																					
Cyrenidæ																					
Sphærium rivicola ...																					
S. corneum ...	72	73	74		76	77		79	80	81	82	83	84	85	86	87	88	89	90		92
S. lacustre ...					76	77	78				82	83	84	85	86		88				
S. pallidum ...																					
Pisidium amnicum ...					76						82				86	87	88				
P. casertanum ...	72					77	78				82		84			87	88				92
P. henslowanum ..					76	77						83									
P. hibernicum ...																					
P. lilljeborgi ...																	88				
P. milium ...							78														92
P. nitidum ...											82		84								92
P. obtusale ...											82			85							
P. parvulum ...																					
P. personatum ...						77	78					83	84			87					92
P. pulchellum ...																					
P. subtruncatum ...											82	83	84								92
P. supinum ...																					
P. tenuilineatum ...																					
Total species **163**	48	64	48	52	64	60	43	43	58	58	71	78	54	65	65	66	65	64	53	40	49

SCOTLAND.																				
lands.				West Highlands.							N. Highlands.						Isles.			Name of Species.
93 Aberdeen N.	94 Banff	95 Elgin	96 Easterness	97 Westerness	98 Main Argyle	99 Dumbarton	100 Clyde Isles	101 Cantire	102 Ebudes S.	103 Ebudes Mid.	104 Ebudes N.	105 Ross W.	106 Ross E.	107 Sutherland E.	108 Sutherland W.	109 Caithness	110 Hebrides	111 Orkney	112 Shetland	Records in italics require confirmation.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	B. leachii
																				Viviparidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Paludina contecta
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. vivipara
																				Valvatidæ
...	...	...	...	...	98	99	...	...	...	03	...	...	...	...	...	...	...	...	...	Valvata piscinalis
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	V. macrostoma
...	...	...	...	...	...	...	...	...	...	...	...	05	06	...	...	...	..	11	...	V. cristata
																				Assemaniidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Assemania grayana
																				Pomatiidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	Cyclostoma elegans
																				Aciculidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Acme lineata
																				Neritidæ
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11	...	Neritina fluviatilis
																...	...	...	...	**Dreissenidæ**
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	Dreissena polymorpha
																				Unionidæ
...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	Unio pictorum
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	U. tumidus
93	94	95	96	...	98	...	...	...	...	...	...	05	06	07	08	...	10	..	*12*	Marg. margaritifera
...	94	95	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Anodonta cygnea
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A. anatina
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Pseudanodonta sp.
																				Cyrenidæ
...	...	...	...	..	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	Sphærium rivicola
...	...	95	...	...	...	99	...	...	...	03	...	...	...	07	08	09	...	...	12	S. corneum
...	...	...	...	...	...	...	...	...	...	...	...	...	06	...	...	...	...	...	...	**S. lacustre**
...	...	...	..	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	**S. pallidum**
...	...	...	...	...	...	99	...	...	...	...	...	...	...	...	...	...	...	...	...	**Pisidium amnicum**
...	94	...	...	...	...	...	00	...	...	...	04	...	06	...	...	...	10	11	12	**P. casertanum**
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	**P. henslowanum**
...	94	...	...	...	...	...	00	...	...	...	...	...	...	...	...	..	...	...	12	**P. hibernicum**
...	...	...	...	...	...	...	00	...	...	...	04	...	...	...	...	...	...	...	12	**P. lilljeborgi**
...	...	...	...	...	...	...	00	...	...	...	...	...	06	...	...	...	...	11	12	**P. milium**
...	94	...	...	...	...	...	00	...	...	...	...	...	06	...	...	...	...	11	12	**P. nitidum**
...	...	...	...	...	...	...	..	...	...	...	...	...	06	...	...	...	10	11	12	**P. obtusale**
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	**P. parvulum**
...	94	...	...	...	...	...	...	...	...	...	...	...	...	...	...	09	10	11	12	**P. personatum**
...	...	...	...	...	...	...	...	...	...	...	...	...	06	...	...	...	...	11	...	**P. pulchellum**
...	94	...	...	...	...	...	00	...	...	...	...	...	06	...	...	...	...	11	...	**P. subtruncatum**
...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	**P. supinum**
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	**P. tenuilineatum**
35	56	53	30	38	61	48	68	44	35	35	41	45	42	45	29	37	41	44	28	*Total species* 163

	IRELAND.																						
	Ulster.										**Leinster.**											
NAME OF SPECIES Records in italics require confirmation.	113 Londonderry	114 Antrim	115 Down	116 Armagh	117 Monaghan	118 Tyrone	119E Donegal E.	119W Donegal W.	120 Fermanagh	121 Cavan	122 Louth	123 Meath	124 Dublin	125 Kildare	126 Wicklow	127 Wexford	128 Carlow	129 Kilkenny	130 Queen's Co.	131 King's Co.	132 Westmeath	133 Longford
Testacellidæ																						
Test. maugei ...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	29	...	...	...	...
T. haliotidea ...	...	...	...	...	...	...	...	...	...	...	...	...	24	...	...	...	...	...	...	...	...	...
T. scutulum ...	...	...	...	16	...	...	...	...	20	...	22	...	24	...	...	...	...	29	..	...	...	...
Limacidæ																						
Limax maximus...	13	14	15	16	17	...	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
L. cinereoniger ...	...	14	...	...	...	18	..	19	...	...	...	...	...	...	26	...	28	...	..	...	...	...
L. tenellus ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
L. flavus ...	13	14	15	16	17	...	...	19	...	21	22	23	24	25	26	27	28	29	30	31	32	...
L. arborum ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	...	...
Agrio. agrestis ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
A. lævis ...	13	...	15	16	17	...	...	...	...	21	22	23	...	...	26	27	28	29	30	...	...	...
Milax sowerbyi ...	...	14	15	16	...	18	19	19	...	...	22	23	24	25	26	27	...	...	30	31	...	33
M. gagates ...	13	14	...	16	17	...	...	...	20	21	22	23	24	25	26	27	28	...	...	31	32	33
Zonitidæ																						
Vitrina pellucida	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
V. pyrenaica ...	..	...	...	...	...	...	...	..	...	...	22	23	...	.	...	...	...	...	...	...	...	...
Hyal. crystallina	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
H. lucida ...	...	14	...	...	...	...	...	...	...	...	22	23	24	...	...	27	...	29	...	31	...	...
H. cellaria ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
H. rogersi ...	...	...	...	...	*17*	...	...	...	...	...	*22*	...	...	...	...	...	...	...	...	...	...	...
H. alliaria ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	...	...	...
H. nitidula ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
H. pura ...	13	14	15	16	17	...	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
H. radiatulȧ ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
Euconulus fulvus	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	...	...
Zonitoides nitidus	13	14	15	...	17	...	*19*	...	20	21	22	23	24	...	...	27	28	29	30	31	32	...
Z. excavatus ...	13	...	...	...	...	18	19	19	...	...	...	...	24	...	...	27	...	29	...	...	...	...
Arionidæ																						
Arion ater ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
A. subfuscus ...	13	14	15	16	17	18	19	...	...	21	22	23	24	25	26	27	28	29	30	31	32	33
A. minimus ...	...	14	15	16	17	18	..	19	20	21	22	23	24	25	26	27	28	29	30	31	...	...
A. hortensis ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
A. circumscriptus	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Geom. maculosus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...
Helicidæ																						
Punct. pygmæum	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	...	32	...
Pyram. rupestris	...	14	...	...	17	...	...	...	20	21	22	23	24	25	...	27	28	29	30	31	32	...
P. rotundata ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
Eulota fruticum...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Helicella virgata	...	14	15	...	17	...	*19*	...	...	...	22	23	24	25	26	27	28	29	30	31	...	...
H. itala .	13	14	...	16	17	...	19	19	...	...	22	23	24	25	26	27	28	29	30	31	...	...
H. caperata agg.	13	14	...	...	...	...	...	...	...	...	22	23	24	25	26	27	28	29	30	31	...	...
H. caperata seg.	13	...	...	...	...	...	...	19	...	...	...	...	...	...	26	...	...	...	30	...	...	...
H. heripensis	...	...	...	...	...	...	...	...	...	...	...	-	...	25	...	...	...	...	...	...	...	...
H. neglecta ...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
Trochula elegans	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cochli. barbara	13	14	15	...	...	...	...	19	...	...	22	23	24	25	26	27	28	29	30	31	32	...
Theba cantiana	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...

IRELAND.

Connaught.						Munster.											
136 Sligo	137 Mayo E.	138 Mayo W.	139 Galway W.	140N. Galway N.E.	140S. Galway S.E.	141 Clare	142 Limerick	143 Tipperary N.	144 Tipperary S.	145 Waterford	146E. Cork E.	146M. Cork Mid.	147 Cork W.	148N. Kerry N.	148S. Kerry S.	NAME OF SPECIES Records in italics require confirmation.	Total counties (153)
																Testacellidæ	
...	...	...	...	...	...	...	...	...	44	45	...	...	...	..	...	Testacella maugei	23
...	...	...	...	...	40	...	...	...	...	...	46	...	...	...	48	T. haliotidea	42
...	...	...	...	...	40	...	...	...	...	...	46	...	...	...	...	T. scutulum	46
																Limacidæ	
36	...	38	39	40	40	41	42	43	...	45	46	46	47	48	48	Limax maximus	144
36	...	38	...	...	40	...	...	...	..	45	...	...	47	48	48	L. cinereoniger	64
...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	..	L. tenellus	23
36	...	38	39	...	40	41	42	43	...	45	46	46	...	48	...	L. flavus	98
36	...	38	39	40	40	41	...	43	44	45	46	46	47	48	48	L. arborum	137
36	37	38	39	40	40	41	42	43	44	45	46	46	47	48	48	Agriolimax agrestis	153
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NAME OF SPECIES Records in italics require confirmation.	Ulster.										Leinster.											
	113 Londonderry	114 Antrim	115 Down	116 Armagh	117 Monaghan	118 Tyrone	119E Donegal E.	119W Donegal W.	120 Fermanagh	121 Cavan	122 Louth	123 Meath	124 Dublin	125 Kildare	126 Wicklow	127 Wexford	128 Carlow	129 Kilkenny	130 Queen's Co.	131 King's Co.	132 Westmeath	133 Longford
T. cartusiana ...	...	..	...	..	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...
Ashfordia gran.	...	...	...	...	..	18	...	..	...	...	...	..	...	25	...	...	...	...	...	...	...	...
Hygromia fusca	13	14	15	16	...	18	...	...	20	...	...	...	24	...	26	27	...	29	30	31	...	...
H. hispida ...	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
H. striolata ..	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
H. umbrosa ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. limbata ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. revelata ...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	..	..	...	...
Acanth. aculeata	13	14	15	16	17	...	19	19	20	...	22	23	24	25	26	27	28	29	30	...	...	...
A. lamellata ...	13	14	15	...	...	...	...	...	20	...	22	...	...	...	26	27	28	29	30	31	...	...
Vall. pulch. agg.	...	...	...	...	..	18	..	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
V. pulchella seg.	13	14	15	16	17	...	..	19	...	...	22	23	24	25	26	...	28	29	30	31	...	33
V. excentrica ...	...	14	...	16	17	...	...	...	20	...	22	23	24	25	26	27	28	...	30	...	...	...
V. costata ...	...	14	15	...	17	...	...	...	...	21	22	23	24	25	26	..	28	29	30	31	...	...
Helico. obvoluta	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	. .	...	...	...
Helicig. lapicida	...	...	...	...	...	...	..	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
A. arbustorum ...	...	14	...	16	...	...	...	19	...	...	...	...	...	...	...	...	...	...	...	...	32	...
Helix pomatia ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. aspersa ...	13	14	15	16	17	...	19	...	20	21	22	23	24	25	26	27	28	29	30	31	...	33
H. nemoralis ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
H. hortensis ...	13	...	15	16	..	18	...	19	...	...	22	23	24	25	26	27	...	29	30	...	32	...
Euparypha pisana	...	...	...	...	...	...	...	..	...	...	22	23	24	...	...	...	...	..	..	...	...	...
Buliminidæ																						
Ena montana ...	...	..	...	...	..	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
E. obscura ...	...	14	...	...	...	...	...	...	..	...	22	23	24	...	26	...	28	29	30	...	...	...
Stenogyridæ																						
Cochli. lubrica ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Azeca tridens ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cæcilio. acicula	...	...	..	...	17	...	...	...	...	21	22	23	24	25	...	...	28	29	30	31	...	...
Pupidæ																						
Pupa marginata...	13	14	15	...	..	...	19	19	...	21	22	23	24	25	26	27	28	29	30	31	...	...
P. umbilicata ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
P. anglica ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	..	...
P. secale ...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	..	...	...
Vert. antivertigo	13	14	15	16	17	...	...	19	20	21	22	23	24	...	26	27	28	29	30	...	...	...
V. substriata ..	13	14	15	..	17	...	..	19	20	21	22	23	24	25	26	....	28	29	30	...	...	...
V. pygmæa ...	13	*14*	15	16	17	...	19	19	20	21	22	23	24	25	26	27	28	29	30	31	...	...
V. moulinsiana ...	...	..	...	...	...	..	...	...	..	...	...	...	...	...	...	...	28	...	30	...	...	...
V. lilljeborgi ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
V. alpestris ...	*13*	*14*	...	...	...	...	...	*19*	...	...	...	...	...	..	...	...	...	...	...	...	...	...
V. pusilla ..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.	...	...	...	...
V. angustior ...	...	14	...	...	...	..	...	...	...	...	...	...	...	...	..	...	28	..	...	...	...	...
Sphy. edentulum	13	14	15	16	17	...	...	19	20	21	22	23	24	25	26	27	28	29	30	..	...	...
S. minutissimum	..	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Clausiliidæ																						
Balea perversa ...	13	14	15	16	17	18	...	19	20	21	22	23	24	...	26	27	28	29	...	31	...	...
Clausilia laminata	...			...	..	...	...	...	20	21	...	...	...	...	...	...	...	...	...	...	32	...
C. biplicata ...					...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	..	...

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onnaught.						Munster.											
136 Sligo	137 Mayo E.	138 Mayo W.	139 Galway W.	140N. Galway N.E.	140S. Galway S.E.	141 Clare	142 Limerick	143 Tipperary N.	144 Tipperary S.	145 Waterford	146E. Cork E.	146M. Cork Mid.	147 Cork W.	148N. Kerry N.	148S. Kerry S.	NAME OF SPECIES Records in italics require confirmation.	Total counties (153)
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	T. cartusiana	6
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	H. revelata	5
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36	...	38	...	...	40	...	...	43	...	45	46	...	...	...	48	V. excentrica	68
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36	37	38	39	40	40	41	42	43	44	45	46	46	...	48	48	V. pygmæa	125
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...	...	...	...	...	40	...	42	...	...	...	...	...	...	...	...	V. pusilla	27
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36	...	38	39	40	40	41	...	43	44	45	46	46	47	48	48	Sphyrad. edentulum	115
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IRELAND.																						
	Ulster.										**Leinster.**											
NAME OF SPECIES Records in italics require confirmation.	113 Londonderry	114 Antrim	115 Down	116 Armagh	117 Monaghan	118 Tyrone	119E Donegal E.	119W Donegal W.	120 Fermanagh	121 Cavan	122 Louth	123 Meath	124 Dublin	125 Kildare	126 Wicklow	127 Wexford	128 Carlow	129 Kilkenny	130 Queen's Co.	131 King's Co.	132 Westmeath	133 Longford
C. cravenensis ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C. bidentata ...	13	14	15	16	17	18	19	...	20	21	22	23	24	25	26	27	28	29	30	31	32	...
C. rolphii ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Succineidæ																						
Succinea putris ...	13	14	15	16	17	18	...	*19*	20	21	22	23	24	25	26	27	28	29	30	31	32	...
S. elegans ...	13	14	15	16	17	...	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
S. oblonga ...	...	14	...	...	...	...	19	...	20	...	...	23	...	..	...	...	...	...	...	...	...	...
Auriculidæ																						
Carychium min.	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
Phytia myosotis...	...	...	15	...	...	...	...	...	...	...	...	...	24	...	...	...	...	...	...	...	...	...
Ovatella bidentata	...	.	15	...	...	...	...	...	...	...	...	23	24	...	..	...	...	...	..	...	...	...
Ancylidæ																						
Ancylus fluviatilis	13	14	15	16	17	...	...	19	20	21	22	23	24	...	26	27	28	29	...	...	...	...
A. lacustris ...	...	14	15	16	17	...	...	...	20	...	22	23	24	...	...	27	...	29	...	...	32	...
Limnæidæ																						
L. auricularia ...	...	14	15	...	...	18	...	19	20	21	22	23	24	...	...	27	28	29	30	...	...	33
L. peregra ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
L. burnetti ...	...	...	...	...	...	...	...	...	20	...	...	...	...	...	...	...	...	...	...	...	32	...
L. prætenuis ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
L. involuta ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	..	...	...	...	..
L. palustris ...	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
L. truncatula ...	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	...
L. stagnalis ...	13	14	15	16	17	18	...	...	20	...	22	23	24	25	...	27	...	29	30	31	32	33
L. glabra ...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphi. glutinosa	...	..	15	16	...	...	...	...	...	...	...	23	...	...	...	...	...	...	30	31	32	...
Planorbidæ																						
Planorbis corneus	...	...	...	...	...	...	..	...	...	..	...	...	...	25	...	...	...	...	...	..	...	...
P. albus ...	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
P. glaber ...	...	14	...	16	...	...	...	19	...	...	22	...	24	...	26	...	...	29	...	...	...	...
P. nautileus ...	13	...	15	16	17	...	19	19	...	21	22	23	24	...	26	27	...	29	...	...	32	...
P. dilatatus ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
P. carinatus ...	13	14	15	16	17	18	...	19	20	21	22	23	24	25	...	27	28	29	30	31	32	
P. complanatus ...	13	14	15	16	17	18	...	19	...	21	22	23	24	25	26	27	28	29	30	31	32	33
P. vortex ...	*13*	...	*15*	...	...	...	..	...	20	21	22	23	..	*25*	...	*27*	...	*29*		31	32	...
P. leucostoma ...	13	14	15	16	17	18	19	19	...	21	22	23	24	25	...	27	28	29	30	31	...	...
Bathy. contortus	13	14	15	16	17	...	...	19	..	21	22	23	24	25	...	27	28	29	30	31	32	33
Hipp. fontanus ...	...	14	15	16	17	...	...	19	...	21	22	23	24	25	26	27	28	29	30	31	32	33
Segment. nitida	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	..	...	...
Physidæ																						
Physa fontinalis	13	14	15	16	17	18	...	19	20	21	22	23	24	25	26	27	28	29	30	31	...	...
P. heterostropha	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...
Aplexa hypnorum	13	14	15	...	17	...	19	19	...	21	22	23	24	25	...	27	28	29	30	...	32	...
Paludestrinidæ																						
Paludest. ventrosa	...	14	...	...	...	...	...	...	...	...	..	..	...	...	...	27	...	...	...	...	...	...
P. jenkinsi ...	13	14	15	16	...	18	...	19	...	...	22	23	...	...	...	27	...	29	...	...	...	...
P. stagnalis ...	13	14	15	...	...	18	19	...	...	...	...	23	24	...	..	27	...	...	...	...	...	...
P. confusa ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	27	...	29	...	..	...	...
Amnicola tavl			...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bith. tenta			15	16	17	..	19	...	20	21	22	23	24	25	26	27	28	29	30	31	32	33

IRELAND.																			
Connaught.								Munster.											
134 Roscommon	135 Leitrim	136 Sligo	137 Mayo E.	138 Mayo W.	139 Galway W.	140N. Galway N.E.	140S. Galway S.E.	141 Clare	142 Limerick	143 Tipperary N.	144 Tipperary S.	145 Waterford	146E. Cork E.	146M. Cork Mid.	147 Cork W.	148N. Kerry N.	148S. Kerry S.	NAME OF SPECIES Records in italics require confirmation.	Total counties (153)
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	C. cravenensis	9
34	35	36	37	38	39	40	40	41	42	43	44	45	46	46	47	48	48	C. bidentata	146
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	C. rolphii	18
																		Succineidæ	
34	35	36	37	38	*39*	40	40	41	42	43	44	45	46	46	47	48	48	Succinea putris	136
34	35	36	37	38	39	40	40	41	42	43	44	45	46	46	...	48	...	S. elegans	123
...	...	...	...	38	39	...	...	...	...	43	...	...	46	46	47	...	48	S. oblonga	22
																		Auriculidæ	
34	35	36	37	38	39	...	40	41	42	43	44	45	46	46	47	48	48	Carychium minimum	141
..	...	...	...	...	...	...	40	41	42	...	...	...	46	...	...	...	...	Phytia myosotis	21
...	...	...	...	...	...	...	40	41	...	...	...	...	46	...	..	...	...	Ovatella bidentata	14
																		Ancylidæ	
34	35	36	...	38	39	...	40	41	42	43	44	45	46	46	47	48	48	Ancylus fluviatilis	137
...	35	36	...	...	...	40	40	41	42	...	44	...	...	...	...	...	...	A. lacustris	86
																		Limnæidæ	
...	35	36	...	38	...	...	40	41	42	...	44	45	46	46	...	...	...	Limnæa auricularia	90
34	35	36	37	38	39	40	40	41	42	43	44	45	46	46	47	48	48	L. peregra	153
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	L. burnetti	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	48	L. prætenuis	1
...	...	...	...	...	...	...	..	...	...	...	...	...	..	...	47	48	...	L. involuta	2
34	35	36	37	38	39	...	40	41	42	43	44	45	46	46	47	48	48	L. palustris	127
...	35	36	37	38	39	40	40	41	42	43	44	45	46	46	47	48	48	L. truncatula	145
34	35	36	37	38	39	40	40	41	42	43	44	...	...	...	...	...	...	L. stagnalis	88
...	...	...	...	...	...	...	...	...	...	...	...	...	...	*46*	...	...	...	L. glabra	34
...	...	...	...	...	...	40	40	41	...	...	...	...	...	...	..	...	...	Amphipeplea glutinosa	23
																		Planorbidæ	
...	...	*36*	...	...	...	..	...	...	42	...	...	...	...	...	...	...	...	Planorbis corneus	48
34	35	36	37	38	39	40	40	41	42	...	44	...	46	46	47	...	..	P. albus	128
...	35	...	...	38	...	...	40	41	...	...	44	45	46	...	...	...	...	P. glaber	52
...	...	36	37	38	39	40	40	41	42	...	44	45	46	46	...	...	48	P. nautileus	112
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. dilatatus	2
34	35	36	...	...	...	...	40	41	42	43	*44*	..	...	46	...	...	...	P. carinatus	80
34	35	36	...	...	...	40	40	41	42	43	44	45	46	...	...	...	...	P. complanatus	93
34	35	36	...	...	...	...	40	41	42	43	...	...	*46*	*46*	...	...	...	P. vortex	71
34	35	36	...	38	39	40	40	41	42	...	44	45	46	46	47	48	48	P. leucostoma	125
34	35	36	37	38	39	40	...	41	42	..	44	45	46	46	47	...	...	Bathyomph. contortus	120
...	...	36	...	38	...	40	...	41	42	...	44	...	46	46	47	...	...	Hippeutis fontanus	97
...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	Segmentina nitida	27
																		Physidæ	
34	35	36	...	38	...	40	40	41	42	...	44	45	46	46	47	48	...	Physa fontinalis	119
..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	P. heterostropha	4
...	...	36	...	38	39	...	40	41	42	...	44	45	46	46	...	48	...	Aplexa hypnorum	97
																		Paludestrinidæ	
...	...	...	...	...	39	...	...	41	...	...	44	...	...	...	...	...	...	Paludestrina ventrosa	15
...	...	...	...	38	...	...	40	41	42	...	...	45	...	...	47	...	48	P. jenkinsi	58
...	...	...	...	...	...	...	40	41	42	...	...	45	46	...	..	...	...	P. stagnalis	41
...	...	...	...	...	...	...	...	41	42	...	...	45	...	...	...	...	...	P. confusa	8
...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Amnicola taylori	2
34	35	36	37	38	39	40	40	41	42	43	44	45	46	46	47	...	...	Bithynia tentaculata	104

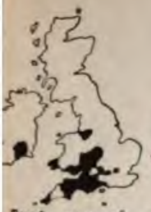
IRELAND.

NAME OF SPECIES Records in italics require confirmation.	Ulster.										Leinster.											
	113 Londonderry	114 Antrim	115 Down	116 Armagh	117 Monaghan	118 Tyrone	119E Donegal E.	119W Donegal W.	120 Fermanagh	121 Cavan	122 Louth	123 Meath	124 Dublin	125 Kildare	126 Wicklow	127 Wexford	128 Carlow	129 Kilkenny	130 Queen's Co.	131 King's Co.	132 Westmeath	133 Longford
B. leachii ...	...	...	...	...	...	..	...	...	...	...	...	...	24	25	...	...	28	29	30	...	...	...
Viviparidæ																						
Paludina contecta	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
P. vivipara ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Valvatidæ																						
Valvata piscinalis	13	14	15	16	17	18	...	19	20	21	22	23	24	...	..	27	28	29	30	31	32	33
V. macrostoma ...	...	..	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...
V. cristata ...	...	14	15	16	17	18	...	...	...	21	22	23	24	25	...	27	28	29	30	31	32	33
Assemaniidæ																						
Assemania graya.	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pomatiidæ																						
Cyclosto. elegans	..	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	. .	...	...	...	...	...
Aciculidæ																						
Acme lineata ...	13	14	15	16	..	...	...	19	...	21	22	23	...	...	26	...	...	29	...	...	..	...
Neritidæ																						
Neritina fluviatilis	...	...	...	...	...	...	...	...	...	...	...	...	24	...	...	27	28	29	...	31	32	...
Dreissenidæ																						
D. polymorpha	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unionidæ																						
Unio pictorum ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...
U. tumidus ...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Marg. margaritif.	...	14	...	16	...	18	...	19	20	21	22	...	24	25	26	27	28	29	...	...	...	...
Anodonta cygnea	...	14	15	..	17	..	...	...	20	21	22	23	24	...	...	...	...	...	30	...	32	...
A. anatina ...	...	...	...	...	. .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pseudanodonta sp.	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	..	...	...	...	...	...	...
Cyrenidæ																						
Sphærium rivicola	...	...	...	..	...	...	...	...	...	...	...	...	.	...	...	...	...	...	...	...	...	...
S. corneum ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
S. lacustre ..	...	14	15	..	17	. .	...	...	...	...	22	23	24	..	26	27	...	29	30	...	...	...
S. pallidum ...	...	...	..	...	...	...	...	...	...	...	...	..	...	...	...	..	...	...	..	...	...	...
Pisidium amnicum	13	14	15	16	...	18	...	...	20	21	22	23	24	25	...	27	28	29	30	31	32	33
P. casertanum ...	13	14	15	16	17	18	19	19	20	21	...	...	24	25	26	27	28	29	30	31	32	33
P. henslowanum	...	14	. .	16	17	18	...	...	20	21	...	...	24	25	..	...	28	29	30	31	...	...
P. hibernicum ...	13	14	15	16	17	18	19	19	20	...	...	..	24	25	26	27	28	29	30	31	32	...
P. lilljeborgi ..	...	14	15	16	...	18	19	19	20	...	...	...	...	...	...	...	...	...	...	...	...	...
P. milium ...	...	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
P. nitidum ...	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
P. obtusale ...	13	14	15	...	17	...	19	19	20	21	22	23	24	25	26	27	28	29	30	31	...	...
P. parvulum ...	...	14	...	...	...	..	...	..	...	...	...	...	24	...	...	..	...	...	...	..	...	...
P. personatum ...	13	14	15	...	17	18	19	19	...	21	22	23	24	...	26	27	28	29	30	...	32	33
P. pulchellum ...	...	14	15	16	...	...	19	19	...	21	...	23	24	...	...	27	28	29	...	...	32	33
P. subtruncatum	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
P. supinum ...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
P. tenuilineatum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...
***Total species* 163**	**73**	**94**	**85**	**77**	**75**	**58**	**41**	**71**	**69**	**74**	**90**	**91**	**97**	**75**	**74**	**87**	**84**	**93**	**83**	**71**	**60**	**33**

IRELAND.																
aught.					Munster.											
137 Mayo E.	138 Mayo W.	139 Galway W.	140N. Galway N.E.	140S. Galway S.E.	141 Clare	142 Limerick	143 Tipperary N.	144 Tipperary S.	145 Waterford	146E. Cork E.	146M. Cork Mid.	147 Cork W.	148N. Kerry N.	148S. Kerry S.	Name of Species Records in italics require confirmation.	Total counties (153)
...	...	...	...	40	..	...	...	...	...	...	...	...	...	...	B. leachii	47
															Viviparidæ	
...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	Paludina contecta	26
...	...	...	..	...	...	*42*	...	...	...	...	...	...	...	..	P. vivipara	42
															Valvatidæ	
37	38	39	40	40	41	42	43	44	45	46	46	47	48	...	Valvata piscinalis	121
...	...	...	...	...	...	...	...	...	..	..	..	...	...	...	V. macrostoma	2
37	38	39	40	40	41	42	...	44	45	46	46	...	...	...	V. cristata	94
															Assemaniidæ	
...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	Assemania grayana	3
															Pomatiidæ	
...	..	...	...	...	...	...	...	...	...	...	...	..	...	...	Cyclostoma elegans	46
															Aciculidæ	
...	38	39	...	...	...	42	...	...	...	46	...	47	48	...	Acme lineata	42
															Neritidæ	
...	38	39	40	40	41	42	43	44	...	...	...	...	...	...	Neritina fluviatilis	62
															Dreissenidæ	
...	..	...	...	...	...	...	...	...	...	...	...	..	...	..	Dreissena polymorpha	38
															Unionidæ	
...	..	...	...	...	...	...	...	...	...	...	...	...	...	. .	Unio pictorum	44
...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	U. tumidus	38
..	38	39	...	40	...	...	...	44	45	46	46	47	...	48	Marg. margaritifera	60
...	38	...	...	40	41	...	...	...	...	...	...	...	...	...	Anodonta cygnea	86
...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	A. anatina	54
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Pseudanodonta sp.	5
															Cyrenidæ	
...	...	..	..	..	...	..	...	...	...	...	...	...	...	...	Sphærium rivicola	32
37	38	39	40	40	41	42	43	44	45	46	46	...	48	...	S. corneum	131
...	...	...	40	40	41	42	...	44	...	46	46	...	...	...	S. lacustre	93
...	...	...	...	...	...	...	..	...	...	..	...	...	...	...	S. pallidum	12
...	...	...	40	40	41	42	43	44	45	46	46	...	...	...	Pisidium amnicum	95
37	38	39	40	40	41	42	43	44	...	46	46	47	...	48	P. casertanum	113
...	...	...	40	40	41	42	43	44	...	...	...	...	...	...	P. henslowanum	64
...	38	39	40	40	41	...	43	44	45	46	46	47	...	48	P. hibernicum	68
37	38	39	40	40	41	...	43	...	...	...	...	...	...	48	P. lilljeborgi	26
..	38	39	40	40	41	42	43	44	45	46	46	47	...	48	P. milium	100
37	38	39	40	40	41	42	43	44	45	46	46	47	...	48	P. nitidum	108
...	38	39	40	40	41	...	43	...	45	...	46	47	48	48	P. obtusale	90
...	...	...	.	40	..	...	43	44	...	...	..	...	.	...	P. parvulum	20
...	38	39	40	40	41	42	43	44	45	...	46	...	48	48	P. personatum	88
...	38	39	40	40	41	...	43	44	45	...	46	...	48	48	P. pulchellum	49
...	38	39	40	40	41	42	43	44	45	46	46	...	48	48	P. subtruncatum	112
...	...	...	..	...	...	...	...	...	..	...	...	...	...	...	P. supinum	21
...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	P. tenuilineatum	4
38	84	79	61	95	100	84	73	81	80	87	75	66	55	68	*Total species* 163	

Specimens for authentication by the Referees for inclusion in the Census should be sent in the first instance to the Recorder, PROF. BOYCOTT, 17, Loom Lane, Radlett, Herts. Slugs should be sent alive if possible.

PLATE III.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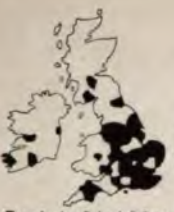
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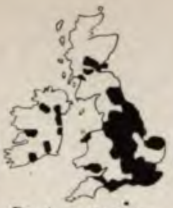
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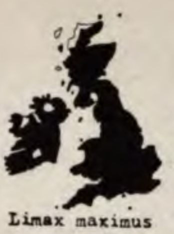
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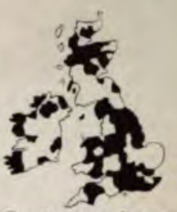
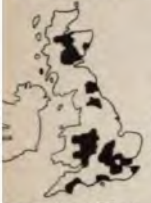
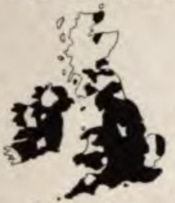

L.cinereoniger


imax tenellus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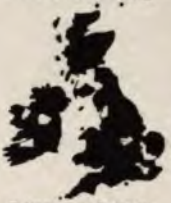
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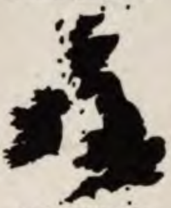
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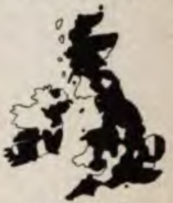
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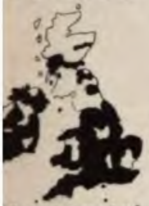
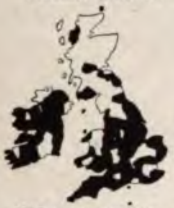
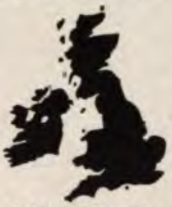
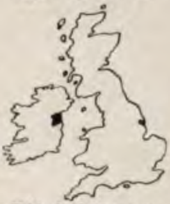
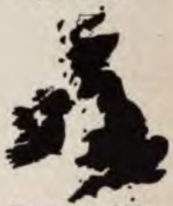
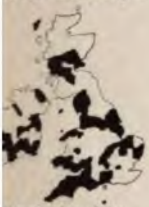

ilax sowerbyi

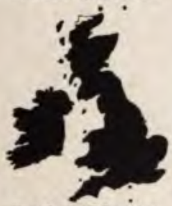

Milax gagates


Vit.pellucida


Vit.hibernica


Hy.crystallina


Hyal.lucida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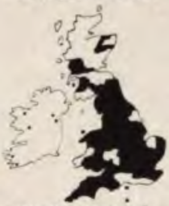
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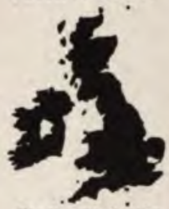
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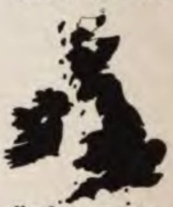
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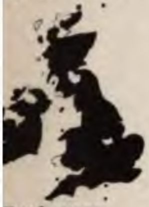
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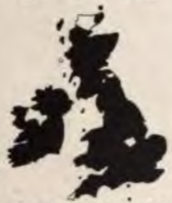
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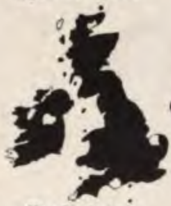
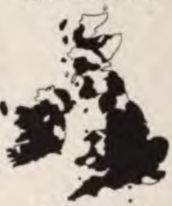

Hyal.fulva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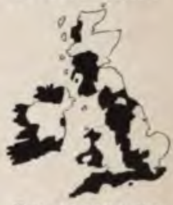
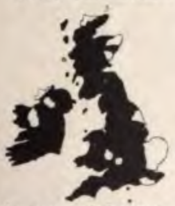
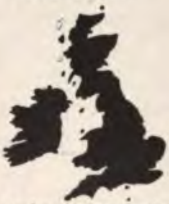
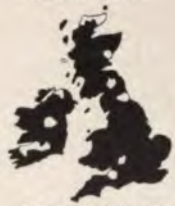

Zon.excavatus

Arion ater


Arion subfuscus


Arion hortensis


Arion minimus

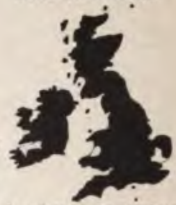
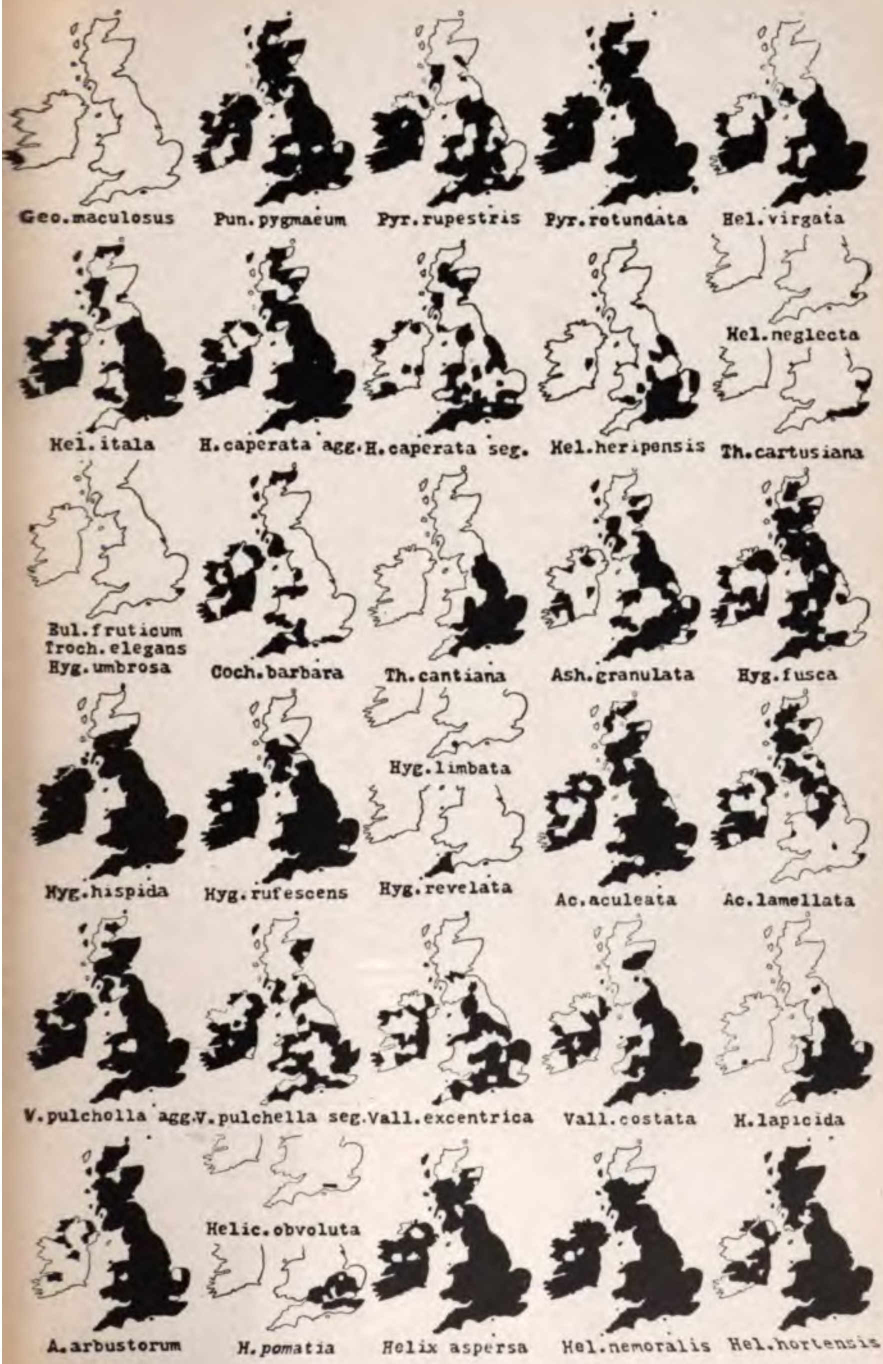
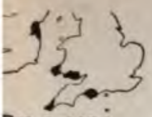
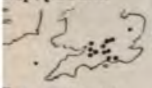
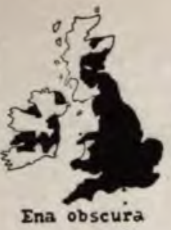

A.circumscriptus

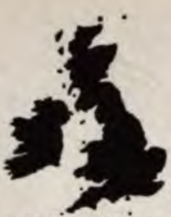
PLATE IV.

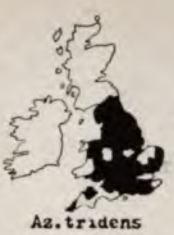

Geo.maculosus
Pun.pygmaeum
Pyr.rupestris
Pyr.rotundata
Hel.virgata
Hel.itala
H.caperata agg.
H.caperata seg.
Hel.heripensis
Hel.neglecta
Th.cartusiana
Bul.fruticum
Troch.elegans
Hyg.umbrosa
Coch.barbara
Th.cantiana
Ash.granulata
Hyg.fusca
Hyg.hispida
Hyg.rufescens
Hyg.limbata
Hyg.revelata
Ac.aculeata
Ac.lamellata
V.pulcholla agg.
V.pulchella seg.
Vall.excentrica
Vall.costata
H.lapicida
A.arbustorum
Helic.obvoluta
H.pomatia
Helix aspersa
Hel.nemoralis
Hel.hortensis

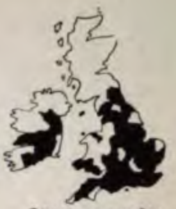

Eup.pisana

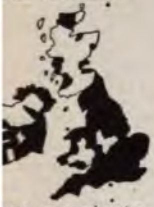

Ena montana

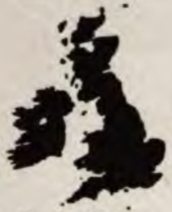

Ena obscura

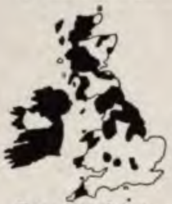

Coch.lubrica

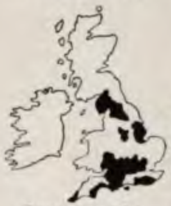

Az.tridens

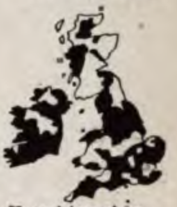

Caec.acicula

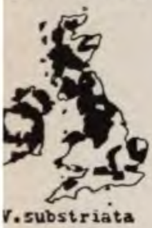

upa marginata

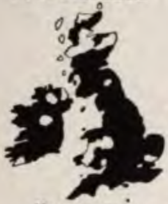

P.umbilicata

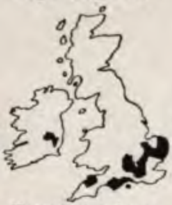

Pupa anglica


Pupa secale


V.antivertigo


V.substriata


V.pygmaea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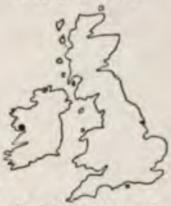
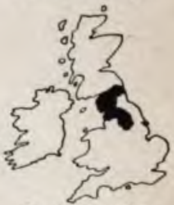
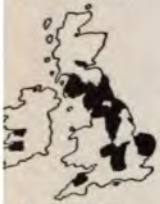
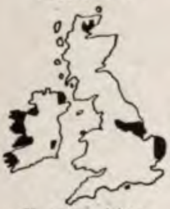
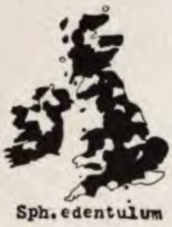
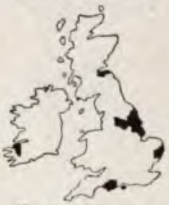

V.lilljeborgi

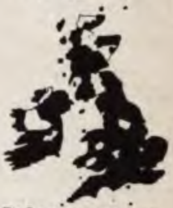

V.alpestris

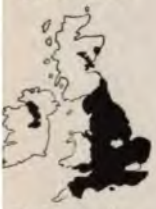

V.pusilla

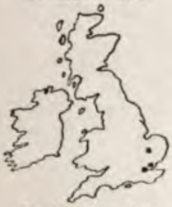

V.angustior

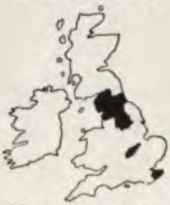

Sph.edentulum

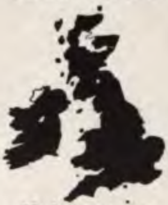

V.minutissima

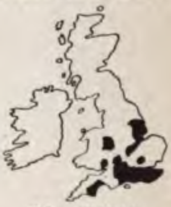

Balea perversa


Cl.laminata

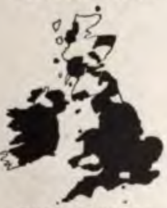

Cl.biplicata

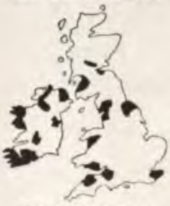

Cl.cravenensis

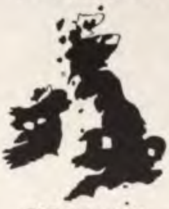

Cl.bidentata


Cl.rolphii

Succ.putris


Succ.elegans


Succ.oblonga


Car.minimum

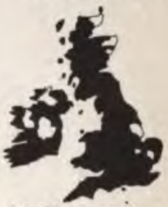
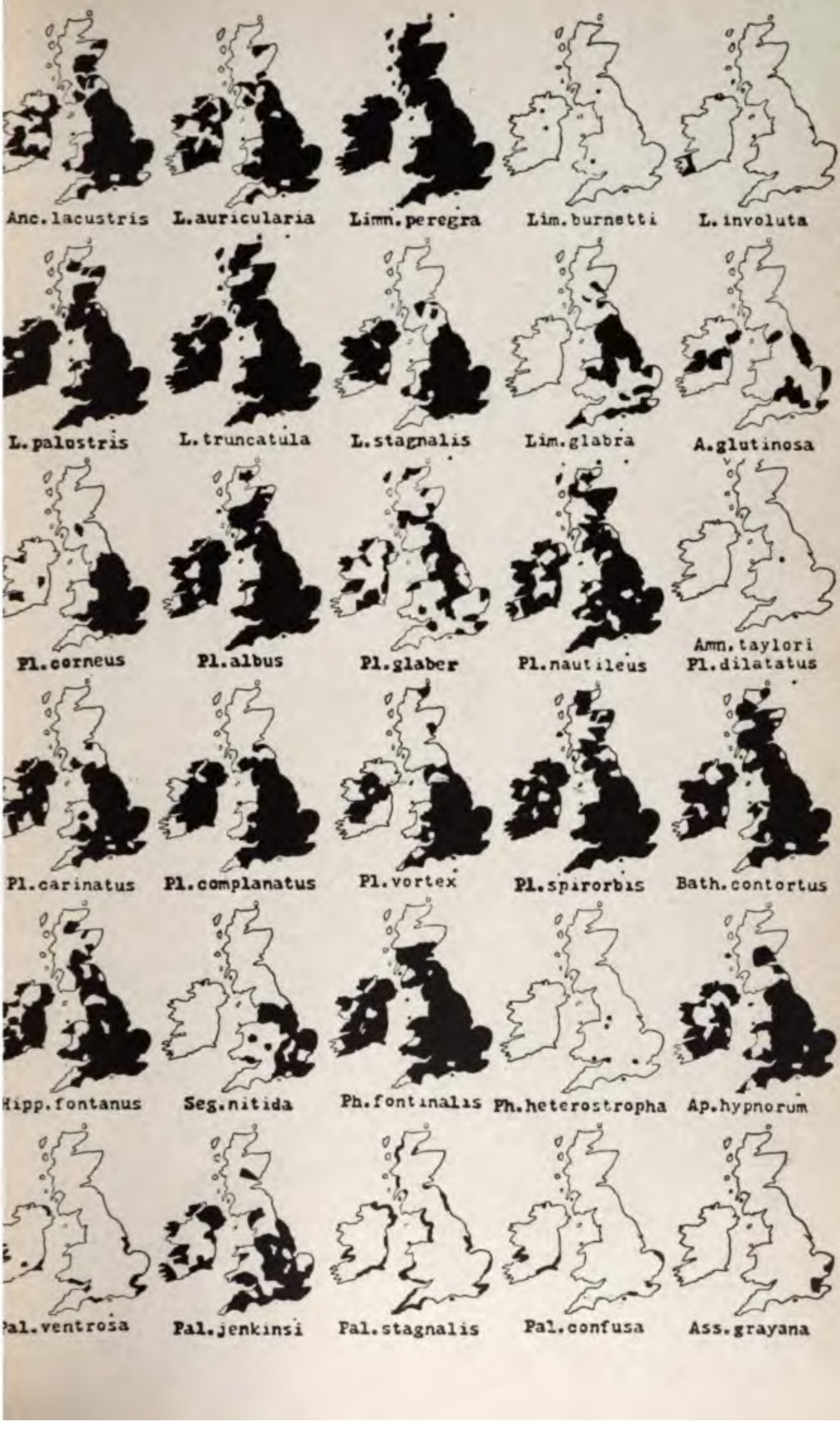
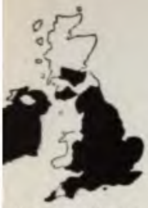

An.fluviatilis

PLATE VI.

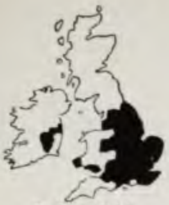


Anc.lacustris
L.auricularia
Limn.peregra
Lim.burnetti
L.involuta
L.palustris
L.truncatula
L.stagnalis
Lim.glabra
A.glutinosa
Pl.corneus
Pl.albus
Pl.glaber
Pl.nautileus
Amn.taylori
Pl.dilatatus
Pl.carinatus
Pl.complanatus
Pl.vortex
Pl.spirorbis
Bath.contortus
Hipp.fontanus
Seg.nitida
Ph.fontinalis
Ph.heterostropha
Ap.hypnorum
al.ventrosa
Pal.jenkinsi
Pal.stagnalis
Pal.confusa
Ass.grayana

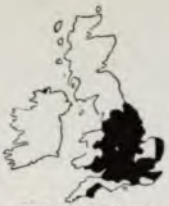
PLATE VII.



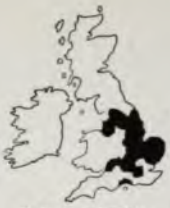
.tentaculata



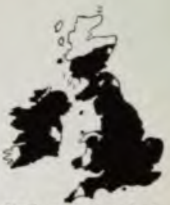
B.leachii



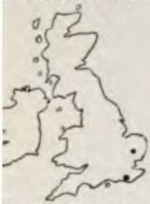
Pal.vivipara



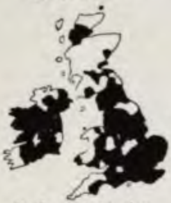
Pal.contecta



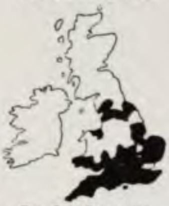
Val.piscinalis



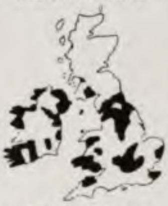
V.macrostoma



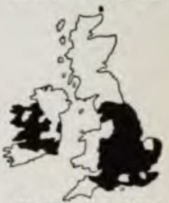
Val.cristata



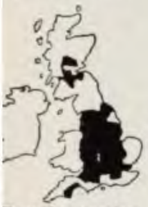
Cycl.elegans



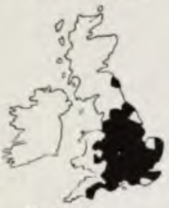
Acme lineata



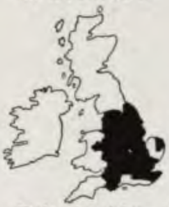
N.fluviatilis



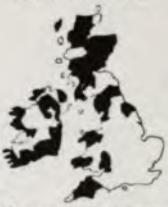
r.polymorpha



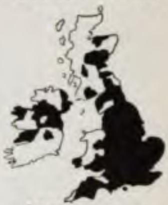
U.pictorum



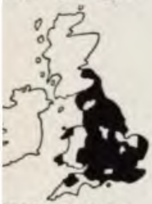
Unio tumidus



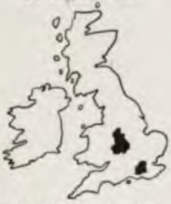
M.margaritifera



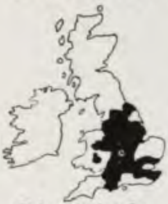
Anod.cygnea



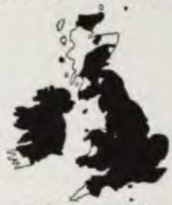
Anod.anatina



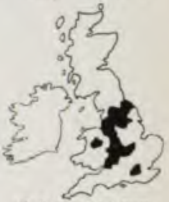
Pseudanodonta



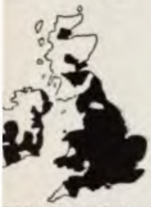
Sph.rivicola



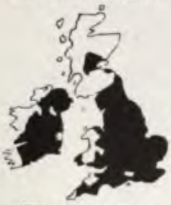
Sph.corneum



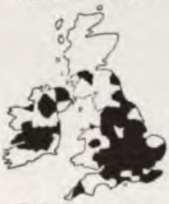
Sph.pallidum



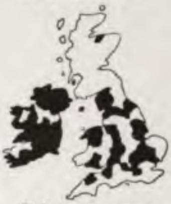
Sph.lacustre



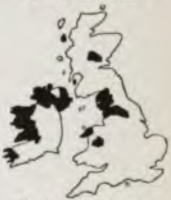
Pis.amnicum



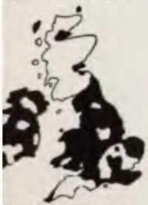
P.henslowanum



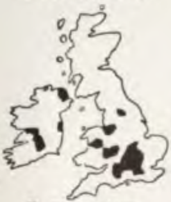
P.hibernicum



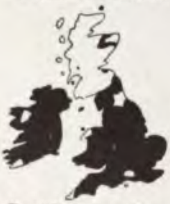
P.lilljeborgi



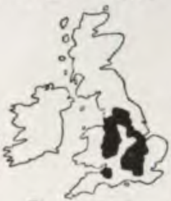
P.obtusale



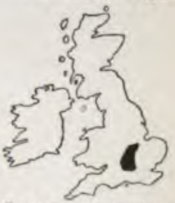
P.parvulum



P.subtruncatum



P.supinum



P.tenuilineatum

THE
JOURNAL OF CONCHOLOGY.

VOL. 16. SEPTEMBER, 1921. No. 7.

OBITUARY NOTICE: GEORGE BRETTINGHAM SOWERBY, F.L.S.

By H. C. FULTON.

(Read before the Society, March 2nd, 1921).

THE conchological world has lost one of its distinguished men, and this Society one of its oldest and most esteemed members, by the death on the 31st January, at his residence, at Richmond, Surrey, of the third George Brettingham Sowerby, the author and artist.

The eldest son of G. B. Sowerby the second, he was born in London on September 18th, 1843. When but seventeen or eighteen years of age he commenced business as a conchologist in his father's house at 45, Great Russell Street, London, W.C.; the business was continued there until 1887, when it was removed to 121, Fulham Road, S.W., from there to Station Parade, Kew Gardens in 1899, and to River Side, Kew, in 1905. From October, 1897, it was carried on under the title of Sowerby and Fulton, and in January, 1916, Mr. Sowerby retired. He married Miss Rose Wilkie in June, 1867, and they had one son and two daughters, all of whom are living.

Many papers were contributed to the proceedings of various societies by our late member, who described, in all, about 720 new species of mollusca; his first paper appeared in the Proceedings of the Zoological Society of London, in May, 1873, and his last in the Proceedings of the Malacological Society of London, in June, 1921.

Perhaps his most important works were:—

1.—A new edition of his father's "Illustrated Index of British Shells," 1887.

2.—The completion of the Monograph of *Turbo* in part 43, and the whole of part 44, completion of the Monographs of *Conus* and *Voluta*, in vol. v. of the "Thesaurus Conchyliorum."

3.—"Marine Shells of South Africa," 1892, and an Appendix, 1897.

4.—"A Monograph of Carinaria," Proc. Mal. Soc., London, 1893.

5.—"Notes on the Ampullaridæ," Proc. Mal. Soc., London, vol. viii, p. 305, vol. ix, p. 56, vol. xii, p. 65.

Many important collections passed through Mr. Sowerby's hands, including those of Lombe-Taylor, Dr. Hungerford, Dr. Prevost, Mr. Keen of Liverpool, A. Gassies, B. C. Thomas, and during his partnership with the writer, those of General Tripe, Lord Ashbrook, Dr. Cox, Admiral van Rees, Admiral Harry Keppell, Mrs. Fitzgerald, L. Bouge, J. B. S. Grateloup (part only), Colonel Parry, A. Denans, Miers, Granger, Guestier, J. S. Gibbons, Carl Bülow, and E. L. Layard.

A member of this Society since 1886, and a Vice-President in 1889, Mr. Sowerby also served on the Council of this Society as well as on that of the Malacological Society of London, of which he was an original member. He was elected a fellow of the Linnean Society in 1888.

Our late member possessed a most genial and generous nature, which endeared him to his many friends. A man of strong character, he endeavoured to live up to the religious principles he professed.

Pisidium tenuilineatum Stelfox **in the Thames.**—A gathering of Pisidia that I made on September 4th, 1920, in the Thames at Streatley, where the river divides Berkshire from Oxon, included a single but quite characteristic example of *Pisidium tenuilineatum*. The Pisidia associated with it were the same, although the proportions in which the individual species occurred were different, as those found in the original locality for *P. tenuilineatum*, the Grand Junction Canal at Cheddington and Marsworth, Bucks., *i.e.*, *P. amnicum*, *casertanum*, *nitidum*, *subtruncatum*, *henslowanum*, *supinum*, and *parvulum*.—CHARLES OLDHAM (*Read before the Society*, December 8th, 1920).

Pisidium parvulum Clessin **in Cheshire.**—A gathering of Pisidia which I made in the Shropshire Union Canal at Beeston Castle on April 6th, 1920, included a single specimen of this species, and on a subsequent visit on July 31st I secured two more. The Pisidia associated with it were *amnicum*, *casertanum*, *subtruncatum*, *supinum*, *henslowanum*, and *nitidum* var. *crassa*. *P. parvulum* is, perhaps, not so rare in this country as has been supposed, for during the past few years I have taken it alive in Middlesex, Surrey, Herts, Bucks., Berks., Oxon, Beds., Northants, Wilts., and Worcestershire, and fossil shells in holocene deposits in Herts. and Beds. It probably often escapes notice owing to its diminutive size and the fact that the coarse-meshed collecting scoops in general use will not retain it.—CHARLES OLDHAM (*Read before the Society*, September 8th, 1920).

Limax cinereo-niger in Kent. — At the Annual General Meeting of the Society I showed a specimen of this slug as a new census record. Mr. Charles Oldham pointed out that it was an unrecorded variety, the ground colour being of a delicate pearly grey, including the keel-line, while the body-markings, which correspond with those of the var. *punctata* of Lessona, are deep ash-coloured with black lateral markings. This variety is not uncommon at Hucking, Kent, where it co-exists with the type and the var. *punctata*.—H. C. HUGGINS (*Read before the Society*, November 10th, 1920).

IX NEW MARINE SHELLS FROM SOUTH AFRICA.

BY J. R. LE B. TOMLIN, M.A.

(Read before the Society, 6th April, 4th May, 7th September, 1921).

PLATE VIII.

Cryptodon eutornus nov. sp. Plate VIII, fig. 5.

is name is proposed for the fine and well known South African ve that has hitherto passed as *Lucina globosa* Forskål. Forskål's es has recently been shown by Lamy (Bull. Mus. H.N. Paris, , p. 155) to = *Lucina lactea* L., and in any case Forskål's descrip- of the hinge shows that his shell was not *C. eutornus*, which has ge typical of *Cryptodon*. The shell is putty-coloured, showing s of a yellowish-brown epidermis, remarkably tumid as the nsions will show ; dorsal margin very nearly straight ; ventral in regularly rounded posteriorly till it joins the dorsal margin, anteriorly the shell is narrowed into the form of a very blunt e.

ngth, 66 mm. ; height, 53 mm. ; diam., 49 mm.

abitat, Port Alfred (Turton) ; Swartkop River (Holub, *fide* sch) ; Durban (McClelland).

ype in coll. Tomlin.

Clementia mcclellandi nov. sp. Plate VIII, fig. 6.

is splendid species bears a considerable resemblance to the ralian *papyracea* Wood, but attains a much larger size. It has ame sort of sculpture—broad, rather distant, concentric ridges, h are most strongly marked on the umbones, and gradually me obsolescent towards the ventral margin ; these ridges and nterstices between them are irregularly and closely grooved with r fine lines.

e umbones are very prominent and swollen and much produced rds the anterior margin. Posterior dorsal margin slightly curved sloping steeply. Pallial sinus deep and tongue-shaped.

ngth, 80 mm. ; height, 78 mm.

abitat, Muizenberg (McClelland), single valves only.

e have great pleasure in dedicating it to its energetic discoverer.

ype in coll. Tomlin.

the Annals of the Natal Government Museum, vol. i, part i, p. 28, h records *Marginella angustata* Sow. from 42 fathoms, off Cape t, and remarks :—" By a curious accident this species was gly recorded by Mr. Sowerby under the genus *Ancilla*." It was, however, an *Ancilla* that Sowerby had before him, and Smith was misled by a careless reference in Sowerby's paper. *Marginella angustata* must be deleted from the South African list. I now have the original specimen of this *Ancilla* before me, as well as several others, and find that, though closely related, it is a species distinct from the East Indian *angustata* Sow. I therefore propose to describe it as

Ancilla errorum nov. sp. Plate VIII, fig. 2.

Shell very similar to *A. angustata* Sowerby, but with a spire that is longer, more acuminate, and less callused. Colour of body-whorl pale, instead of liver-coloured; colour below columellar band white and sharply defined. Upper part of columella spirally grooved within aperture; lower part deeply longitudinally grooved as in *angustata*, but with five grooves instead of three.

Habitat, Cape Point, 42 fathoms.

Type, in the Cape Town Museum.

I am able also to figure the operculum of this species.

Marginella[1] **epipolia** nov. sp. Pl. VIII, fig. 1.

This very beautiful shell I received from the late Mr. Sowerby as a particularly fine example of *M. bairstowi* Sow., and I also procured one similarly labelled from the J. J. McAndrew collection. But while *bairstowi* has exactly the shouldered body-whorl and general build of *mosaica* in miniature, *M. epipolia* has a much longer spire, and the shouldering is almost obsolete.

The shell is highly polished, whitish; whorls 5½; body-whorl with twelve fine spiral interrupted grey lines, traces of other subsidiary lines, and a good deal of irregular greyish shading: there are on the grey lines much darker spots at regular intervals. The periphery is well marked by a white band, and the space between periphery and suture is covered with grey flame-shaped axial markings. The penultimate and antepenultimate whorls have the white band immediately above the suture and the same arrangement of flame-shaped markings above. Protoconch yellowish; columella with four plaits.

Long., 17·5 mm.; diam. max., 9·5 mm.

Habitat, dredged in 24 faths., off San Sebastian's Bluff, S. Africa.

Type in coll. Tomlin.

Clanculus atricatena nov. sp.

Shell broadly and depressedly conical, apex brightly rose-coloured, the rest lighter or darker brown; there are about nineteen or twenty beaded spiral ridges on the last whorl, nine on the penultimate and eight on the antepenultimate, and every third ridge is noticeably spotted at intervals with black, each spot covering from one to three beads; the last six or seven ridges on the base and usually the ridge below the suture are much broader, with flattened oblong sculpture instead of beading; interstices with close oblique cross striation; sutures well marked; umbilicus small but deep, with four or five sharply acute axial ridges round its mouth: armature of aperture similar to that of *C. corallinus.*

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[1] ἐπιπόλιος, grizzled.

Diam. max., 17 mm.; alt., 12·5 mm.

Habitat, Durban (McClelland and others).

Type, in coll. Tomlin.

This shell must, I think, be what has been several times recorded as *C. kraussi* Phil. The latter was described from unknown locality, but has since been recognised as a West African shell, of which I possess a series from S. Thomé Island. It is small and conical, akin to the Mediterranean *cruciatus* L. as Fischer says, but both he and Pilsbry give the dimensions far too large; thus they give the maximum diameter as 19 mm., while Philippi in his original description gives it as about 9·5. *C. atricatena* is more of the build of *guineensis* Gmel.

Natica aureozona nov. sp. Pl. VIII, fig. 3, 4.

Shell small, white, polished, with a broad golden band of colour on the body-whorl, just above the periphery, and another, more or less interrupted, immediately below the suture; the apical whorls are of the same colour, and there is a spot likewise on the umbilical callus. The umbilicus is completely closed; whorls 4½ in number; spire very short; aperture white and pear-shaped.

Diam. max., 6 mm.; altitude, 6 mm. Aperture 3 mm. in length. Breadth of peripheral colour band, 1 mm.

Habitat, Port Alfred (Turton).

Type in coll. Turton, Oxford University Museum.

This species, while not possessing any very striking characteristics, appears to be undescribed. In general appearance it is not very unlike *decipiens* Smith, but is imperforate, rather less conical, has a longer body-whorl, and different colouration.

◆

ON SOME SPECIES OF PISIDIUM IN THE SWEDISH STATE MUSEUM.

By NILS HJ. ODHNER.

(Read before the Society. May 4th, 1921).

THE discrimination of the species belonging to the genus *Pisidium* has always been fraught with great difficulty. To some extent this fact has been due to the smallness, which rendered a careful examination of their entire organization impracticable for the purpose of determination. To base the specific characters exclusively on the shell—a general practice in the past—has led to much confusion, as the shell is subject to considerable variation, and presents no absolutely constant characters.

In 1908 I found[1] that the soft parts offer important evidence with regard to the taxonomy of the group; thus the gills show differences in their formation, inasmuch as the posterior one may be present though more or less reduced, or it may be totally absent. Subsequent researches have confirmed this opinion. I intend soon to publish my investigations: on this occasion I will only call attention to some facts of special interest.

Even the anatomical characters, however, are not constant. For example: the posterior gill, even in species where it is normally present, may be reduced or totally absent. These conditions of the gills occur in connection with reduced body size, and are probably due to unfavourable environment. That such a lack of the posterior gill is not restricted to the juvenile stage, where the anterior gill originates earlier than the posterior one, is proved by the fact that dwarfs often have fry within their gills. A tendency to a sort of neoteny thus seems to be prevalent in the genus, at least in certain species, e.g., *P. subtruncatum* and *P. milium*, where I have observed a partial or complete reduction of the posterior gill in small forms with fry.

The reproduction of the Pisidia is of great interest, since self-fertilization seems to be common—perhaps the rule in certain species. Attempts to cultivate them have yielded the following results. In the autumn of 1919 a number of Pisidia were caught and kept living throughout the winter in a small aquarium. During this time the animals reduced their functions of life to a minimum; they continued wholly withdrawn into their shells, and nothing but the pulsations of the heart indicated their living state. Among them was a single *P. milium* and a single *Sphærium corneum*. A great many individuals perished during the winter, and few survived until the spring. Then, re the normal functions of life had begun, I isolated some in rate glasses. The animals gradually became more active; first intestine, which had been empty before, was observed to be filled green algæ; and the liver, which earlier was greyish like the re animal, acquired the normal brown tint. The genital glands n afterwards began to appear as blackish masses in front of the cardium; nothing of them had been visible before.

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[1] Die Mollusken der Lappländischen Hochgebirge. Naturwiss. Unters. Sarekgebirges in Schwedisch-Lappland, gel. v. Dr. Axel Hamberg, IV, 2, Stockholm, 1908.

n many of the specimens thus isolated, belonging to *nitidum*, *rtanum*, and *milium*, as well as *Sphærium corneum* (of the two it will be remembered there were but single specimens under ivation), embryos were developed within the gills and later on ased. Though I had not opportunity to continue the cultivation, ink I am justified in concluding that the young in these cases e produced by means of self-impregnation.

. *henslowanum* and *P. lilljeborgi* were also isolated in the same nner, but did not show any development of the genital organs, bably because the stock to which they belonged had bred in the mn just after capture.

t may be questioned whether autogamy is a common phenomenon erhaps the rule, at least in certain species—in the Pisidia; yet r ubiquitous occurrence may perhaps be a consequence thereof. his is the case, they should reproduce themselves along so called re lines." For this supposition speaks the fact that, as a rule, in y fry-bearing specimen of *Pisidium* a complete conformity exists ween all the young, and these may be rather numerous; I have erved up to twelve or sixteen (*P. obtusale*) or even twenty (*hiber-m*) in one individual. Only in one species have I found a arkable exception to this rule; in the case of *P. henslowanum* umbonal appendiculæ vary considerably so that they may be well eloped or totally absent in different young within the same her; this variation seems to suggest that this is a mendelian racter. Experimental investigations on such hereditary problems, which the Pisidia seem to be well adapted, would certainly give resting results.

take here the opportunity of drawing attention to a character of shell of *Pisidium*, which has been misinterpreted and has given to incorrect statements in literature. I refer to the fact that the ls of the young are quite smooth, not hairy, and the same is the with all forms in adult stage. Many authors maintain, like odward, that the shell of *Pisidium* is "sometimes, especially in ng individuals and certain species, sparsely covered with short s." But the "hairs" are something quite different, namely pores ling into short canals, which penetrate, mostly perpendicularly, into the calcareous layer of the shell but not into its cuticle ; in these canals are contained fine threads from the pallial epithelium, which is thus fixed to the inside of the valves. The nature of these canals is most evident in the small and fragile *P. clessini*, where they run not perpendicular to, but parallel with, the shell surface, probably as a consequence of the thinness of the shell ; they are, moreover, easily seen from the outside. Often there may be seen two or more canals branching from a common pore, a character peculiar to *P. clessini*. The contents of these canals were easy to demonstrate by infusing some decalcifying liquid. When the shell was dissolved—a process which could be directly followed under the microscope — there remained the thread-like contents of the vanished canal, issuing from an epithelial cell of the mantle.

This porous structure of the *Pisidium* shell has also been detected independently and almost simultaneously by Mr. Stelfox.

Below I give some notes on a few species which have been subject to much discussion or else are unsatisfactorily known. I beg to express my thanks to Mr. Stelfox, who has given me much information in discussing the matter with me.

Pisidium torquatum Stelfox, 1918.

(*P. parvulum* Woodward, 1913, *non* Clessin, 1873).

Four specimens of this species are present in the Stockholm Museum, labelled "*P. conicum* Baudon, Dinkelscherben, S. Clessin," and the label is written in Clessin's characteristic hand. The largest specimen measures 2 mm. in length, and 1·6 mm. in height. The German examples differ somewhat in shape from those found in the Fure Lake in Denmark, being more lengthened and having the angle on the anterior slope less accentuated. The umbonal plaits are, however, typical, and the striation is irregular. Woodward gives as a synonym for the present species *P. alienum* Martens, but I have failed to find any description of such a form. There exists certainly a *Pisidium alienum* of Clessin (Martini and Chemnitz, Conch. Cab., 1877), but this is a large and quite different shell. Under these circumstances the species should be named *torquatum*, as proposed by Stelfox (1918).

I have had the opportunity to examine its anatomy in Danish specimens kindly sent me by Dr. Steenberg, and it is of great interest to be able to state that the soft parts differ from those of our common species of Pisidium, inasmuch as there is only one gill on each side (in other Pisidia generally two, of which the posterior is less developed) ; moreover, there is only one siphonal opening, viz., the anal one, the branchial being contained in the pedal slit ; further, the nephridium is shaped somewhat differently, and shows, seen from the dorsal side, an entire lobe only slightly concave in front; this lobe, in other Pisidia, is divided by a fissure.

Thus *P. torquatum* proves distinct not only in conchological but also in anatomical characters. Its umbonal appendiculæ, as Stelfox has pointed out, are one of its chief external marks, which it shares with *P. henslowanum*. In the last-named species, however, the appendiculæ may occasionally be ill-defined or absent, and the same may perhaps occur in *P. torquatum*; is it possible that *P. tenuilineatum* Stelfox may be an analogous inappendiculate and more regularly striate variety?

P. torquatum has not been found in Sweden. *P. parvulum* Clessin described from Ronneby, South Sweden, is quite different, as stated by Stelfox; it is identical with *P. hibernicum* Westerlund (see below).

Pisidium clessini Surbeck, 1899.

(*P. tornense* Odhnér, 1908; *P. pusillum* Woodward, 1913 (*pars*) *non* Jenyns.

The chief organization of *P. torquatum* is common to the present species; thus there is only one gill on each side, only one siphon, and a similar nephridium. The shell characters are, however, quite different, and the very weak teeth, the long distance between cardinals and laterals, as well as the shape of the rather fragile shell, recall *P. nitidum*. The chief difference lies in the shape of the cardinals; tooth 3 (right valve) is situated in the lowest margin of the hinge-plate, and consists of a thick and straight posterior and a slightly curved anterior half. Teeth 2 and 4 (left valve) are short, and the latter does not cover more than the posterior end of the former. The sculpture consists of weak and irregular concentric lines, gradually vanishing towards the umbones. The porosity of the shell is of a singular nature, as I have already mentioned. *P. tornense*, which was originally described from Lake Torne Träsk in Swedish Lappland, was incorrectly identified by Woodward (1913) as *P. pusillum* Jenyns. The same species also occurs in deep and cold lakes in Southern Sweden (e.g., Lake Vättern), and subsequent research has convinced me that it is partially identical with *P. clessini* Surbeck (which, however, includes *P. nitidum*) from Lake of Lucerne, whence material was sent me by Prof. Zschokke. The name *clessini*, consequently, must be considered valid for the present; probably it will prove synonymous with one of Clessin's deep water Pisidia from the Alpine lakes.

This interesting glacial species has not yet been recorded from other localities. Mr. Stelfox has, however, sent me specimens from two places in the British Islands, viz., "a cold water tarn on Brandon Mountain, at 2,500 feet altitude, Co. Kerry, Ireland" (A. W. Stelfox and R. Welch, 24/9/1910); and "the upper tarn, in Cwm Glas, at 2,475 feet altitude, Snowdon" (Oldham, 17/7/1916).

The two above-named species, *P. torquatum* and *P. clessini*, differ so essentially from all other members of the genus hitherto studied in the anatomical respects mentioned, that I think it justifiable to create a subgenus for their reception, and for which I propose the name **Neopisidium,** in contradistinction to the subgenus **Eupisidium,** which would comprise the species with two gills on each side and two siphonal openings.

Pisidium hibernicum Westerlund, 1894.

(*P. parvulum* Clessin, 1873, *nec* Benson[1] *nec* Woodward).

As Stelfox has stated, the *P. parvulum* of Clessin is different from *P. parvulum* of Woodward (1913). In the Stockholm Museum there are some small specimens labelled in Clessin's handwriting "*P. parvulum* Cless., leg. Westerlund, Blekinge," which are probably types. They consist of some small and globular examples of *P. hibernicum*, together with two small shells of *P. milium*. In another box from the same locality (Långasjö, Ronneby), and labelled "*P. parvulum*," *P. hibernicum* was found together with *obtusale*, *milium*, and *nitidum*; and a third box contained *hibernicum* and *obtusale*. Mr. Stelfox states that he has come to the conclusion "that Clessin's *parvulum* is this little form of *hibernicum*," and the above statements justify his opinion.

By the kindness of Prof. J. Thiele I had the opportunity to examine a specimen of Clessin's var. *martensi*. This specimen appeared to be referable to *P. obtusale*. The remaining ones, the actual types, could not be sent for examination.

The distribution of this species seems rather wide (cf. Phillips and Stelfox, 1918, Schlesch, 1920).[2] I have examined the collections of the Swedish State Museum, and it appears that *P. hibernicum* has been collected in the following districts:—

Sweden:—Bohuslän: Nordkoster (an island off the coast), some large specimens: maximum length, 3·1 mm. (Ljungman, 1865). Västergötland: Surroundings of Borås (Sundler, 1917). Skåne: Lund (Westerlund, det. as *obtusale*). Östergötland: Lake Tåkern, common (N. Odhner, 1908-20, cf. Woodward, 1913). Gottland: Visby, 1879 and Eketräsk, Fårö (Stuxberg, 1867). Södermanland: Dalbyö, south of Trosa (E. Nordenskiöld). Dalarne: Säter (det. by Clessin as *obtusale*). Härjedalen (N. Odhner, July, 1910): Sveg, in Ljusnan; Lunån, north of Hede: Flåsjön, Ljungan, 13 metres in mud.

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[1] Vide Hanley and Theobald, Conchologia Indica, 1876, p. 63.

[2] Phillips and Stelfox: Recent Extensions of the Range of *Pisidium hibernicum*, Irish Naturalist, March, 1918. Schlesch, *Pisidium hibernicum* Westerlund in Denmark, Naturalist, May, 1920.

NORWAY: Without definite locality (Esmark, det. by Clessin as *obtusale*).

FINLAND: Lake Enare (Malm), some large specimens (length 3 mm.). This locality is of special interest since it proves that *P. hibernicum* occurs far towards the north.

Pisidium personatum Malm, 1855.

I have not had any opportunity of examining the soft parts of this species, and therefore cannot express any opinion about its affinities and specific validity; but it seems to be distinct in shell characters. The latter have been established in an accurate manner by Woodward (1913), who has drawn attention to the callosity in front of the posterior laterals as the chief characteristic of the species. This feature is well marked in the type, as I have convinced myself by examining Malm's originals.

The species seems very rare in Sweden; it has been collected only at Gothenburg in Halland (Malm), and at Visby, Gottland.

Pisidium pusillum of B. B. Woodward.

In a paper "On the *Pisidium nitidum* and *P. pusillum* of Jenyns: a Reply" (*Journal of Conchology*, 1918), Woodward has quoted a statement of mine, and referred this to his *P. pusillum*. He says:— "This species as identified by me . . . shows a peculiarity in its gill-structure in both deep and shallow water forms." This statement, however, should refer to the species which I described in 1908 as *P. tornense*, and which has erroneously been identified by Woodward with *P. pusillum* Jenyns. It is quite a distinct species, as shown above (v. *P. clessini*).

I think Stelfox is correct in regarding *P. pusillum* of Woodward, with this exception, as identical with *P. nitidum* Jenyns. It is not easy to distinguish between the two species in Woodward's sense, and they cannot be separated either by their shell characters or by their anatomy. Mr. Woodward has kindly sent me specimens named by him *P. pusillum*, as well as some named *P. nitidum*, the latter exactly similar to specimens forwarded by the older English naturalists (e.g., Alder). In examining large series of Pisidia from Lake Tåkern, I have failed in my attempts to allot the specimens to one or other of Woodward's forms; on the contrary, I have found frequent transition between them. It may be stated that in the specimens received from Mr. Woodward as typical *pusillum*, two gills on each side could easily be seen, in spite of their dry state.

Malm's *P. pusillum* is quite another species, namely *P. casertanum*, according to original specimens which I have examined.

NOTES ON THE LAND AND FRESHWATER MOLLUSCA OF EAST ICELAND.

By HANS SCHLESCH.

(Read before the Society, April 6th, 1921).

DURING the summer 1919 and 1920 I have had the opportunity to examine the land and freshwater mollusca at several places in the neighbourhood of Leydisfjord, and in August, last summer, I took two trips over the 3,000 feet high pass Fjardarheidi, to the long and narrow valley, Fljótsdalr. As my records, and the few from other collectors, show, the fauna of East Iceland bears relations to Scandinavia more than the other parts of Iceland. Also the species occur in greater numbers, probably East Iceland here and there have more lime in the rocks, while most of Iceland is poor in lime; moreover, the climate during the summer is rather hot, about 20°C., and steamy. The flora has close relations to that of the Faroes. The mountains are tolerably high and precipitous, about 3,000 feet, and consist mostly of tertiary Basalt and Liparite. Minerals occur everywhere, especially calcareous spar, and in single places marble. For Zeolites the east coast is well known. Most of my specimens I have put up in the Hull Museum and Reykjavik Museum. Remarkable is the absence of *Limnæa geisericola*, a form of *L. pereger*, characteristic of the numerous hot springs in Iceland, but in Iceland there are only a few of such, far from inhabited places.

My best thanks are due to Messrs. Chas. Oldham, R. A. Phillips, A. W. Stelfox, and John W. Taylor for assisting me in examining my specimens.

Abbreviations:—A.C.J., A. C. Johansen; B.S., Bjarui Sœmundsson; H.A.S., Hans Schlesch; F.H.S., F. H. Sikes.

Limax arborum Bouchard-Chantereaux.—Seydisfjord (H.A.S.). Certainly common all over.

Var. **alpestris** Lessona and Pollonera (= var. *rupicola* Lessona and Pollonera).—Seydisfjord (H.A.S.).

Var. **nigra** Scharff.—Seydisfjord, one specimen (H.A.S).

Agriolimax agrestis (Linné). —Seydisfjord (H.A.S.). Very common over Iceland, together with the var. *reticulata* (Müller).

Vitrina pellucida Müller var. **angelica** Beck.—Nordfjord, 1912 (F.H.S.). Seydisfjord (H.A.S.). Very commonly distributed. The specimens from Seydisfjord very big.

Euconulus fulvus (Müller) (= *E. fabricii* Beck).—Seydisfjord (F.H.S. and H.A.S.). Common.

Hyalinia alliaria (Miller).—Seydisfjord (H.A.S.). Rare.

Hyalinia radiatula (Alder).—Seydisfjord (H.A.S.). Rare.

Arion ater (Linné).—Lodmundarfjord, Mjóafjord, Nordfjord, and Seydisfjord (H.A.S.). Probably spread along the east and south coast. Very common among grass.

Arion subfuscus Draparnaud.—Seydisfjord (H.A.S.). Common.

Arion circumscriptus Johnston.—Seydisfjord, July 1919, single specimen (H.A.S.). New to Iceland.

Helicigona arbustorum (Linné).—Búlandstiudr in Berufjord, 1900 (A.C.J.). Nordfjord, 1912 (F.H.S). Seydisfjord (Eagle Clarke, B.S. and H.S.). Bödvarsdalr in Vopnafjord, 9th Sept., 1898 (B.S.). Very common on the rocks among grass, and is probably distributed along the south coast also. The specimens are thin shelled, dark, and mostly small (var. *alpestris* L. Pfeiffer). Mr. John W. Taylor has also found the var. *rudis* Megerle among the specimens.

Helix hortensis Müller.—Recorded for Nordfjord by F. H. Sikes (*J. of Conchology*, 1913, p. 56). I have hitherto not seen the species here, but in South Iceland it is recorded from several places.

Pupilla muscorum (Linné). — Seydisfjord, single specimens (H.A.S.).

Cochlicopa lubrica (Müller).—Seydisfjord (H.A.S.). Rather common among grass.

Succinea grœnlandica Beck.—Occurs in great numbers above Firdi in Seydisfjord, on moist ground, near running water, especially on *Bryum*, 3rd June, 1921.

Var. **albina** nov.—Shell white. Twelve specimens with the above. Type in coll. Schlesch, Hull Museum.

Radix pereger (Müller) var. **ovata** Draparnaud.—Fljótsdal, 9th Sept., 1898 (B.S.). Eidar, 1920 (H.A.S.).

Var. **piniana** Hazay.—A single dead shell in a small water, above Firdi in Seydisfjord, June 3rd, 1921.

Limnæa truncatula (Müller).—Egilstadr in Fljótsdal and Seydisfjord (H.A.S.). Very common in ditches.

Gyraulus glaber Jeffreys.—Eidar in Fljótsdal, three dead specimens (H.A.S.).

Pisidium amnicum Müller.—Egilstadr in Fljótsdal, few specimens (H.A.S.).

Pisidium pulchellum Jenyns.—Eidar in Fljótsdal, Vestdalseyri, and Seydisfjord (H.A.S.).

Pisidium nitidum Jenyns.—Snjóholt, Eidar, and Ketilsstödum in Fljótsdal, Vestdalr, Vestdalseyri, and Seydisfjord (H.A.S.).

Pisidium subtruncatum Malm.—Snjóholt, Eidar, and Ketilsstödum in Fljótsdal, Vestdalr, Vestdalseyri, and Seydisfjord (H.A.S.).

Pisidium casertanum (Poli).—Vestdalr and Seydisfjord, Egilstadr and Snjóholt in Fljótsdal (H.A.S.).

Pisidium milium Held.—Vestdalr, Vestdalseyri, ditches at Fjardará and Seydisfjord, Snjóholt and Eidar in Fljótsdal (H.A.S.).

Pisidium henslowanum (Sheppard).—Ketilsstödum and Eidar in Fljótsdal (H.A.S.). New to Iceland.

Pisidium hibernicum Westerlund.—Ketilsstödum and Eidar in Fljotsdal, Vestdalseyri near Seydisfjord (H.A.S.). New to Iceland.

◆

Leda buccata Stimpson **from British Waters.**—While dredging in Orkney in 1917, I obtained two valves of a *Leda* I was unable to name. I submitted them to Mr. Tomlin who identified them as *L. buccata* St., and kindly sent me examples from Greenland for comparison. They are probably sub-fossil, as I obtained in the same haul (20 fathoms, Hoy Sound) many examples of *Astarte borealis* Schum. and *Tellina calcarea* Gm. *Leda buccata* is recorded from the Pleistocene gravels of Ballybrack near Dublin.—R. Winckworth (*Read before the Society*, May 12th, 1920).

Helicella virgata (Da Costa) **Destroyed by Moles.**—Near St. Ouen's Bay, Jersey, is a range of sandhills through which runs a beaten track. On the track side is a quantity of low herbage upon which innumerable *Helicella virgata* (Da Costa) feed. This sandy waste is also inhabited by moles, and their hills can be seen in numbers, but what strikes the observer is that almost every one of these molehills is covered with the dead shells of *H. virgata*, which have fallen upon the sand thrown up and have been unable to escape, dying practically where they fell. The numbers of dead shells upon the undisturbed sand beneath the herbage is negligeable compared with the number upon the molehills for the same area. At the time I visited the spot in 1910 there had only been rain upon two days in seven weeks, and the sand was therefore very dry and hot. Whether the moles when throwing up the sand shake off the *H. virgata* from the herbage around I cannot say, but appearances would suggest that they do, or on the other hand the molluscs may drop to the ground in the ordinary course of their life, and whereas they can regain the herbage when the sand beneath has not been freshly disturbed, they cannot do so when the sand is loose as on the molehills. In any event the moles unknowingly are responsible for the destruction of hundreds of *H. virgata* in this locality.—A. K. Lawson (*Read before the Society*, February 11th, 1920).

Note on the Mactra complanata of Reeve and Deshayes.—This fine species was described by Deshayes in the Proceedings of the Zoological Society, 1853, p. 14, and by Reeve in Conchologia Iconica, vol. viii, pl. xii, fig. 54. It is always credited to Deshayes, but his paper was not published till June 27th, 1854, whereas Reeve's plate xii appeared in April, 1854. In any case, however, the name is preoccupied by *Mactra complanata* Gmelin (now *Lutraria complanata*), and as I cannot find any other name applicable, I propose to rechristen Reeve's species ***chionia***. It belongs to the genus *Mactrinula*.—J. R. le B. Tomlin (*Read before the Society*, April 6th, 1921).

NOTES ON KENTISH MOLLUSCA.

By REV. CANON J. W. HORSLEY.

(Read before the Society, November 10th, 1920).

Mr. H. C. Huggins in "Notes on Kentish Mollusca" says that *Helix hortensis* is more dominant than *H. nemoralis.* I am interested to know that this is the case on the northern slope of the downs, but it is not the case on the southern slope on which I live. I have been here (Detling) for nine years, and have not seen *H. hortensis* yet, while *H. nemoralis* is rare, and nearly all the specimens I have found have been in my garden. The difference may arise from soil, as we have chalk and chalk rubble, while from the top of the "Backbone of Kent" down to the estuarine marshes clay and sand prevail. The rarity of *H. nemoralis* and the absence of *H. hortensis* is probably due to the abundance of chickens, wood pigeons and pheasants. I do not remember having found broken *H. hortensis* round a "thrush stone." The smaller and thinner shell may not require smashing.

He does not mention *H. pomatia*, although it is found on his side of the downs in places, e.g., Ospringe and Doddington. Common along the Pilgrims Way, through the parishes of Westwell, Charing, and Lenham ; it then disappears, although the conditions of soil, aspect, and vegetation remain the same, and reappears only after fifteen miles or so (the Medway intervening) in the Shoreham and Dartford country. I have tried to colonize it in my garden, but with the usual result. To show where it has been found, I have coloured a map of Kent, with the parochial divisions, and should be glad to know of authentic additions. The eastern locus includes Lenham, Charing, Westwell, Otterden, Stalisfield, Throwley, Eastling, Ospringe, Newnham and Doddington; the western, Sevenoaks, Otford, Kemsing, Woodlands, Brasted, Shoreham, Eynsford, Cudham, Down, and Keston. I have not included the Surrey habitats which no doubt join on to this locus.

◆

Pomatias elegans (Müller) **at Llandudno.**—In face of Mr. Beeston's statement on page 143 of the January number, I think it may be worth recording that I found several living specimens of *Pomatias elegans* on the banks alongside the Marine Drive (Great Orme's Head) between the Happy Valley entrance and the disused copper mines in May, 1920, and that amongst the dead shells sifted from a rainwash at the same place by far the most numerous species was *P. elegans*, many of the shells being comparatively fresh, and opercula being common.—A. K. Lawson (*Read before the Society*, February 2nd, 1921).

NOTES ON THE GROWTH AND VARIATION OF UNIO PICTORUM (Linné).

By W. E. ALKINS, M.Sc.

(Read before the Society, May 14th, 1919).

The statistical study of variation of species seems to offer a prospect of furnishing valuable results from the point of view of a more accurate and close definition of species, although many more data are required before broad generalisations are possible. The more immediate value of such research lies in the fact that it directs attention very definitely to the conception of a species as a group of individuals which approximate, in each and every given character, to a certain mean value, the divergence of the various individuals from this mean being in accordance with the law of chance.

The following enquiry is based on a series of 250 specimens of *Unio pictorum* (Linné), collected about thirty years ago, in the Hereford Waterworks Reservoir, where they lived in fine mud in soft moorland water.

The dimensions of the shells were determined by means of an optician's sliding gauge, reading in millimetres, and each was taken to the nearest millimetre. The "length" was taken as the greatest dorso-ventral axis, perpendicular to the hinge-line, and was found by placing the fixed arm of the gauge along the ligament, with the valves closed, and bringing up the movable arm until it was just in contact with the ventral margin—of course near the posterior end. The "width" was taken similarly as the greatest antero-posterior axis, parallel with the hinge-line, and the "thickness" as the greatest lateral axis, perpendicular to the length and width axes. The values of the three were noted for each shell, and the ratios width : length and thickness : length were determined.

As a preliminary investigation of the results obtained, the number of shells of each length, width, and thickness was found, and the corresponding distribution curves plotted ; these are of no particular interest. The length curve had a maximum at 26 mm., with a sub-maximum at 32 mm., the width curve had two maxima at 55 and 75 mm. ; and the thickness curve shewed a maximum at 16 mm., and a sub-maximum at 22 mm. (the units taken for the three curves were 2 mm., 5 mm., and 2 mm. respectively). The occurrence of a second maximum or a sub-maximum in each case appears to indicate that the specimens belonged mainly to two generations.

Now, the width : length and thickness : length ratio curves were plotted (figs. 1 and 2 respectively); the data are given in Tables I and II below; the distance between successive abscissæ was 0·05 over a range of 0·50 (from 2·05 to 2·55), and 0·02 over a range of 0·22 (from 0·54 to 0·76) respectively. The width : length curve in particular shews some irregularities, but these are of little importance in view of the probability of the occurrence of errors of measurement, which it is impossible entirely to eliminate.

TABLE I.

Vidth/Length ...	2·05	2·10	2·15	2·20	2·25	2·30	2·35	2·40	2·45	2·50	2·55
No. of Individuals	2	14	13	39	35	52	50	31	13	7	4

TABLE II.

ickness/Length	0·54	·56	·58	·60	·62	·64	·66	·68	·70	·72	·74	·76
of Individuals	1	4	13	22	39	48	41	38	26	9	8	1

There can be little doubt, so far as these characters go, that the group of shells measured forms a single biological entity, without any tendency towards a differentiation into two or more forms. Neither is any such tendency shown in other features, less susceptible of direct measurement, such as thickness of shell, position and character of the teeth, and so on. We may, therefore, proceed with confidence io enquire into the manner of growth of the species.

The length has been taken as the standard because it appears to give the best measure of the degree of growth attained by the shell. All shells of the same length were collected together, and the width and thickness of each were used to determine the maximum and minimum and the mean width and thickness corresponding to each particular length. The results are shewn in Table III, and are plotted in figs. 3 and 4. Mean values are shewn as crosses, and the upper and lower limits by dotted and continuous irregular lines. The straight lines shew the width or thickness to be expected if the mean value of each corresponded throughout the series with the most frequently occurring width : length or thickness : length ratio, as shewn in figs. 1 and 2 respectively. Below a length of 23 mm. the number of specimens is too low to give trustworthy data, and the curves below this length are too irregular to be of much value; the same is true above a length of 35 mm.

Fig. 1.

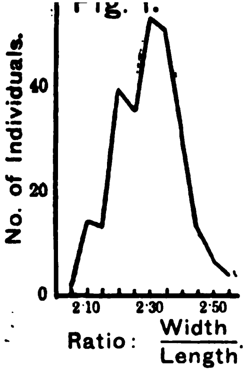


Fig. 2.

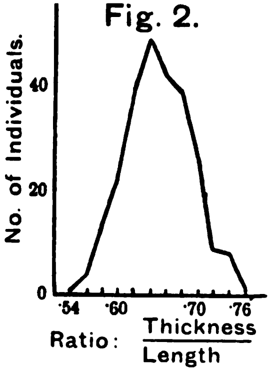
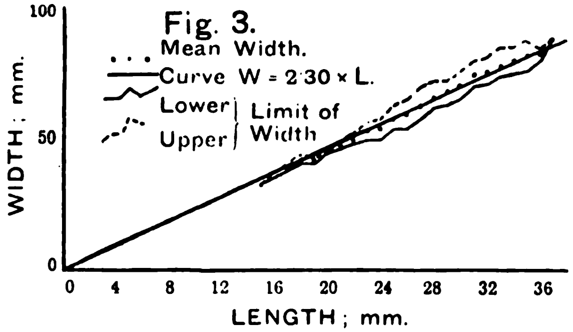
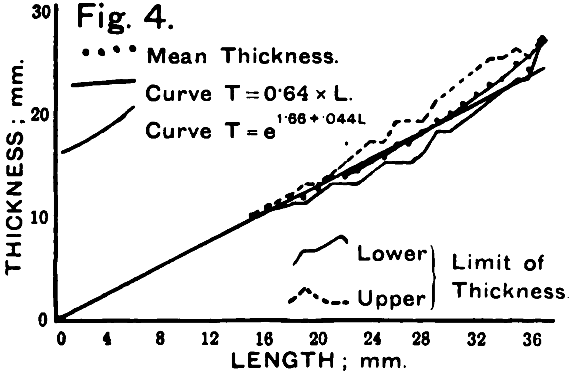


Fig. 3.



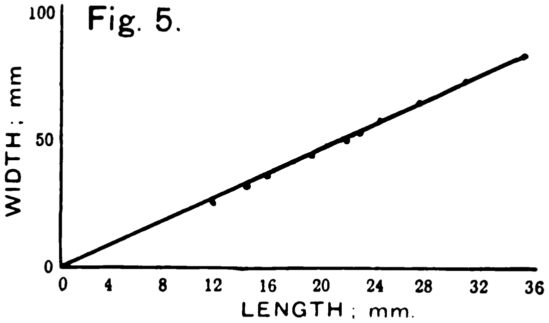
Relationship of Length and Width

Fig. 4.



Relationship of Length and Thickness.

Fig. 5.



Relationship of Length and Width Ontogeny).

The area enclosed between the lines shewing the upper and lower limits, divided by the difference between the greatest and least lengths found, gives a measure of the variability of the species.

TABLE III.

Length	No. of shells.	Width millimetres.			Thickness millimetres.		
mm.		Min.	Max.	Mean.	Min.	Max.	Mean.
15	1	32	32	32·0	10	10	10·0
16	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...
18	3	40	43	41·7	11	12	11·7
19	4	40	42	41·25	11	13	11·75
20	2	44	44	44·0	12	13	12·5
21	3	46	48	47·0	13	14	13·7
22	4	48	52	49·25	13	15	13·75
23	22	49	56	52·3	13	16	14·3
24	8	49	57	53·5	14	17	15·1
25	15	53	62	57·1	15	17	15·5
26	25	53	64	58·8	15	19	16·8
27	27	57	69	61·9	15	19	16·9
28	17	61	71	64·8	16	19	18·0
29	17	62	71	67·4	18	21	19·1
30	19	64	75	69·8	18	22	19·8
31	21	69	79	73·9	19	23	20·7
32	18	70	80	74·6	20	24	21·6
33	15	73	84	77·0	21	25	22·5
34	17	74	84	79·2	22	25	23·0
35	9	75	87	80·9	23	26	24·5
36	2	79	84	81·5	23	25	24·0
37	1	88	88	88·0	27	27	27·0

Fig. 3 shews that the width is throughout a linear function of the length—in other words, a definite increment in length is always accompanied by an equally definite increase in the width. But in the case of the thickness (fig. 4) this is no longer true: the ratio thickness : length increases gradually as the length increases, and this tendency becomes more pronounced as the length increases.

In the case of the width : length relationship, the ontogeny of a number of individuals was followed by tracing on the shell a series of growth lines, and determining the length and width corresponding to each of these. This was done for twelve shells, selected to give as wide a range as possible in the value of the width : length ratio of the adult shell. In every case the curve of width against length was, within the limits of experimental error, a straight line. The figures for the first specimen so treated are given in Table IV, the corresponding curve being shewn in fig. 5. Thus it appears that the ontogeny is in complete agreement with the growth curve based on the whole series of shells.

TABLE IV.

Length, mm.	11½	14	15½	19	21½	22½	24	27	30½	35
Width, mm.	25	31	35	43	48½	51	56	63	71	81

It was not found practicable to follow the growth of an individual in the case of the relation between thickness and length.

However, it appears legitimate to assume that here again the ontogenetic curve will agree with that given by the series; in *Unio pictorum*, as in other bivalves—***Anodonta cygnea*** Linné, ***Sphærium corneum*** Linné, etc.—the young shells are always slender, and this fact, coupled with the proof above given in the case of the width: length relation, seems to justify the assumption.

Over the range between lengths 23 and 35 mm., the curve shewing the variation of thickness with length agrees almost perfectly with the expression :—

$$T = e^{1 \cdot 66 + 0 \cdot 044\,L},$$

where L = length in mm., T = thickness in mm. ; the curve corresponding with this equation is given in fig. 4 (broken curve).

This is particularly interesting in view of a recent investigation of Petersen.[1] From the mathematical analysis of data obtained by measurement of individual *Clausilia laminata* Mont., he establishes an exponential law of the type :—

$$Y = e^{a + bx + cx^2},$$

for the growth of the species. He then shews that measurements of the height and of the chest in man, of the number of rays in the caudal fin of plaice, of the weight of *Clausilia laminata*, of the length of beans (*Phaseolus multiflorus*), of the ratio of the width of the head to the length of the body in crabs, of the number of florets of *Chrysanthemum segetum*, and of the weight of beans, give distribution curves which are in agreement with this law. In the particular case where $c = 0$, the equation reduces to :—

$$Y = e^{a - bx},$$

which Petersen designates the "law of quotients." It is of interest to note that the curve connecting thickness and length in *U. pictorum* agrees with an equation of this simpler type.

SUMMARY AND CONCLUSION.

From measurement of the length, width, and thickness of a series of *Unio pictorum* it has been shewn that :—

1.—The width is directly proportional to the length throughout growth. This is true also of the ontogeny of individual shells.

2.—The thickness (T) is related to the length (L) according to the law :—

$$T = e^{1 \cdot 66 + 0 \cdot 044 L}$$

over the range $L = 23$ to $L = 35$ mm.

LITERATURE.

1.—Une Loi Fondamentale de l'Accroissement des Organismes, par Chr. Petersen. Copenhague : Imprimerie Bianco Luno ; 1919.

Pearl in Littorina littorea L.—In the course of consumption a small pearl was found in a specimen of *Littorina littorea*. It is quite spherical, and of a reddish colour, and 1·5 mm. in diameter. The only other instance I have seen recorded is by Jeffreys, Brit. Conch., vol. iii, p. 373, where the pearl was one-tenth-of-an-inch, or about 2·5 mm. in size, and was "round and white."—W. T. ELLIOTT (*Read before the Society*, February 2nd, 1921).

Pisidium lilljeborgii in Montgomeryshire.—In October, 1920, I collected several specimens of *P. lilljeborgii* in Llyn Du, a tarn at about 650 feet near Meifod in the valley of the Vyrnwy. They were living in silt at the roots of *Isoetes* at a spot where the bed of the tarn was stony, and associated with them were *P. milium* and *P. hibernicum* in small numbers. Near the outlet of the tarn there was a good deal of mud, and here *P. milium*, *P. subtruncatum*, *P. nitidum*, and *P. casertanum* occurred in some plenty. The only other molluscs I noticed were *Limnæa pereger*, *Planorbis albus*, and *Valvata piscinalis*.—CHARLES OLDHAM (*Read before the Society*, December 8th, 1920).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

498th Meeting, held at the Manchester Museum, January 5th, 1921.

Mr. G. C. Spence in the chair.

Donation to Library.

"Les Variations et leur Hérédité chez les Mollusques," by Paul Pelseneer (*presented by the author*).

Candidates Proposed for Membership.

Miss Jessie D. Robertson, 9, Buckingham Mansions, West End Lane, London, N.W. 6; Leslie S. V. Watson, 32, Granville Road, Stroud Green, London, N. 4. (both proposed by A. E. Salisbury and seconded by G. C. Spence).

Resignation.

Capt. J. Noble Kennedy.

Paper Read.

"*Acanthinula lamellata* var. *albida* and *A. harpa* near Borås, Sweden," by Berthold Sundler.

Principal Exhibits.

By Mr. J. E. Cooper: *Helicella virgata*, near Yiewsley (presented to Cabinet).

By Mr. F. Taylor: *Vitrea rogersi* (remarkably large and richly-coloure examples), from Romiley (presented to Cabinet).

By Mr. B. Sundler: *Acanthinula lamellata* var. *albida* and *A. harpa*, fro near Borås, Sweden (presented to Cabinet).

By Mr. W. H. Heathcote: *Limax maximus* var. *nigra*, from Longton, Lancs.

The Special Exhibit was *Cochlitoma*.

ACCOUNTS FOR YEAR ENDED DECEMBER 31st, 1920.

INCOME AND EXPENDITURE ACCOUNT.

		£	s.	d.
To Annual Subscriptions:				
For 1920, 126 at 10/0	63 0 0			
4 at 7/6	1 10 0			
1 at 6/0	0 6 0			
72 at 5/0	18 0 0			
	82 16 0			
Arrears ...	3 15 0	86	11	0
,, Sale of Publications ...		22	16	5
,, Donations towards cost of Illustrations		2	5	7
,, Advertisements		1	10	6
		£113	3	6

		£	s.	d.
By deficit on Jan. 1st, 1920		16	16	0
,, Publishing and Distributing *Journal of Conchology*:				
vol. xvi, pt. 3,	29 13 0			
,, pt. 4,	33 4 7	62	17	7
,, Authors' Reprints ...		4	16	6
,, Printing and Stationery		4	8	0
,, Fire Insurance		0	10	0
,, Warehousing Stock ...		1	5	0
,, Expenses of Ann. Meeting		4	16	0
,, Subscriptions:—				
Malacological Soc.,	1 1 0			
Lancashire & Cheshire Fauna Comm.	5 0	1	6	0
,, Officers' Expenses:—				
Secretary ...	6 8 5			
Treasurer ...	1 5 2			
Editor ...	0 10 0			
		8	3	7
,, Balance, being excess of Income over Expenditure		8	4	10
		£113	3	6

LIFE MEMBERSHIP FUND.

	£	s.	d.		£	s.	d.
To amount of Fund Jan. 1, 1920	85	8	10	By Commission on Purchase of Stock	0	1	3
,, One Composition Fee ...	6	6	0	,, Amount of Fund on Dec. 31st, 1920	111	11	8
,, Donations by Life Members	14	12	0				
,, Dividends and Interest ...	5	6	1				
	£111	12	11		£111	12	11

BALANCE SHEET.

	£	s.	d.		£	s.	d.
Annual Subscriptions paid in Advance	9	2	6	Annual Subscriptions for 1920 Outstanding: 24 at 5/0, estimated to produce ...	3	12	0
Life Membership Fund ...	111	11	8	4% Funding Loan £130 8 4 cost	100	0	0
Balance of Income and Expenditure Account ...	8	4	10	Cash at Bankers	28	19	0
Balance, being excess of Assets over Liabilities	3	12	0				
	£132	11	0		£132	11	0

NOTE.—Assets in addition to those set out in the Balance Sheet are (*a*) Library; (*b*) Cabinets and Collections; (*c*) Stock of Unsold Publications; (*d*) Annual Subscriptions in arrear prior to January 1st, 1920.

CHAS. OLDHAM,
Dec. 31st, 1920. *Hon. Treasurer.*

Audited and found correct, C. H. MOORE,
E. RIDSDALE BROWN.
January 4th, 1921.

* * *

Polita rogersi in Leigh Woods, Somerset N.—The above shell is by far the commonest of the Zonitidæ in this famous wood near Bristol. It is a great favourite of mine owing to the fact of its body being stronger when on the end of a pin, 99 out of a 100 coming out of their shells whole, whereas with me *P. cellaria* and *P. alliaria* are the reverse. *Hygromia fusca* is fairly common on the bank side of the road above the woods. I believe this has not been recorded for Somerset N.—DOUGLAS BACCHUS (*Read before the Society*, November 10, 1920).

NOTE ON TROCHUS PENNANTI Philippi.

By J. R. le B. TOMLIN, M.A.

(Read before the Society, April 6th, 1921).

In several of the Channel Isles there is found commonly a *Gibbula* which bears a close resemblance to the common *umbilicalis* daCosta (*umbilicata* Mont.), but is usually more conical, differently coloured, and in the adult state has no trace of an umbilicus.

[1] Forbes and Hanley refer to this form, but do not name it; [2] Jeffreys erroneously calls it var. *agathensis* Récluz—a well-known Mediterranean form, which is always narrowly but deeply umbilicate. Jeffreys also remarks (l.c., p. 314):—"it is the var. *læta* of the Rev. R. T. Lowe." This is an equally bad shot; I have Lowe's type series of his [3] var. *lætus* from Mogador in my collection, and find it to be a distinctly perforate form as Lowe himself states.

Norman corrected the Jeffreysian *agathensis* to var. *sarniensis* Norm. in Mus. Norm., pt. iv, p. 20 (1888), but this name cannot be considered valid as all the parts of the *Museum Normanianum* are "printed for private distribution."

It is likewise the *Gibbula umbilicatis* da Costa var. *imperforata* of Dautzenberg in his Liste Granville et Saint-Pair, p. 12. I have however, recently in the British Museum come across the type specimen of *Trochus pennanti* Phil., which Philippi [4] described as a British species from the Hanley Collection, and which proves to be the Channel form under discussion.

It is, I think, a matter for congratulation that we can add to the British list a name which commemorates so eminent a British zoologist as Pennant.

It now remains for the anatomists to determine whether or no this form should resume the specific rank which Philippi so emphatically claims for it.

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[1] British Mo[illegible] p. 521.

[2] British [illegible] p. 313.

[3] [illegible] Society, 1860, p. 179.

[4] [illegible], pl. xxxiv, f. 10.

NOTE ON THE STOMATELLA BICARINATA, S. BIPORCATA AND S. MARGARITANA OF A. ADAMS.

By J. R. le B. TOMLIN, M.A.

(Read before the Society, April 6th, 1921).

These three species were described and figured in the Monograph of *Stomatellinæ* in the second volume of the *Thesaurus*, but do not appear to have since been recognised. As a matter of fact, all these names apply to well-known species, belonging to the genus *Gibbula* as understood by Pilsbry in the *Manual of Conchology*, vol. xi.

S. bicarinata A. Adams, l.c., p. 839, pl. 175, f. 39, 40, 1854.

The type of this species still exists in the British Museum (ex mus. Cuming), and proves to be identical with *Gibbula coxi* Angas, over which it has priority.

S. biporcata A. Adams, l.c., p. 839, pl. 175, f. 43, 1854.

The types of this species show it to be a Cape shell, the Australian habitat given in the *Thesaurus* being incorrect. The late Mr. Sowerby redescribed it under the same [1] name, under the impression that Adams' name was only a manuscript one. In the *Journal of Conchology*, vol. vi., p. 153, erroneously recorded as *bifurcatus* A. Ad.

S. margaritana A. Adams, l.c., p. 839, pl. 174, f. 31 (not 54 as stated in the text), 1854.

Also a well-known Cape shell and not Australian, as stated in the original description. It is the same species as *Trochus roseus* Gmelin, and therefore sinks as a synonym.

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EDITORIAL NOTES.

Very hearty congratulations to the Honorary Secretary, Mr. J. W. Jackson, on the degree of M.Sc., which has recently been conferred on him by Manchester University honoris causa.

Mr. Jackson has for some time past been making a special study of the Brachiopoda, and we ought some time ago to have called attention to his paper thereon in the Natural History Reports of the "Terra Nova" Expedition of 1910. Ten species were obtained, and a new genus *Compsothyris* is erected for *Rhynchonella racovitzæ* Joubin.

Another interesting paper of his was issued in the Annals and Magazine of Natural History for last January, "On the Occurrence of Lusitanian Brachiopods in the Persian Gulf." The specimens were dredged by Mr. F. W. Townsend, off Dabai, and are identified as *Terebratulina caput-serpentis* L. var. *abbreviata* nov., *Mühlfeldtia truncata* L., type form and var. *paucistriata* nov. Both these specific names are so familiar that it is hardly necessary to point out the extensions of geographical range that this discovery denotes.

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[1] Marine Shells of South Africa, pp. 44, 67.

THE MOLLUSCA OF OUNDLE.

By THE REV. C. E. Y. KENDALL, B.A.

(Read before the Society, February 12th, 1919).

DURING the past decade a great deal of valuable work has been done in mapping out in this country the various types of woodland and the associations of plant life on different soils and under varying conditions of moisture, shade, and altitude. In this paper it is proposed to deal on ecological lines with the mollusca of a small area in the Eastern Midlands. The mollusca have in their individual life a very small range, so small that they may be described as "spot-bound," and consequently they lend themselves better perhaps to this method of study than any other group of living creatures. It has of course long been known that many species of mollusca have a pronounced preference for certain definite types of habitat, away from which the species is not to be found; but it appears that, by means of careful search and comparison of records, it is possible to define the association of species which may be found living together in any particular habitat. This work can only be done by degrees, and it is hoped that these notes may be of value to those who are working on similar lines.

The area dealt with is that lying within a radius of about five miles of Oundle, a small town in the north-eastern part of Northamptonshire. It is a purely inland area, through the midst of which flows the River Nene, a stream of medium size with a good volume of water and a fairly rapid current. There are no extremes of altitude, the country on both sides of the river being of a gently undulating nature, rising at the most to about 300 feet above sea-level; it is well wooded, extremely so on the western side, where it includes many outlying fragments of the ancient Forest of Rockingham.

The geological formations are fairly simple in their main outlines, comprising principally the upper strata of the Jurassic System. The higher lands both east and west of the river are wholly Oxford Clay, while nearer the river and at a lower level appear strata of the Oolite, viz., the Cornbrash and the clays and limestones of the Great Oolite. A large section has as a covering a thin mantle of Glacial Drift, usually consisting of a calcareous clay, and so is well adapted to support a large and varied molluscan life.

In comparison with the complex geographical and geological conditions of some districts, the very simplicity of those conditions here is of great value, as it enables one to establish one's conclusions, even if they be limited in number, by the collation of a great number of similar examples.

TYPES OF HABITAT IN THE OUNDLE DISTRICT.

A.—Type of Dry Grasslands.

§ 1. *Calcareous Pasture.*
§ 2. *Non-Calcareous Pasture.*
Sub-section : *Subterranean.*

B.—Type of Wet Grasslands.

§ 1. *Marsh.*
§ 2. *Hard-Water Ponds.*
§ 3. *Soft-Water Ponds.*
§ 4. *Soft-Water River and Streams.*

C.—Type of Woodlands.

§ 1. *Alder-Willow Woodland.*
  A. *Osier Beds.*
§ 2. *Ash-Oak Woodland.*
  A. *Beech Woods.*

A.—Dry Grasslands.

§ 1. *Calcareous Pasture.*

In what was originally Forest there can of course be no absolutely natural calcareous pasture, such as that of the Chalk Downs, or the grassy uplands of a Mountain Limestone region, but there is here a very large acreage of permanent pasture land, much of which has never been broken by the plough. If the land went out of use it would revert in due course to Scrub and then to Woodland, but in its present state it may be regarded as a permanent development of dry calcareous pasture and shows the molluscan association typical of such a habitat.

Characteristic species:—*Helicella itala*, *Pupilla muscorum*, *Vertigo pygmæa.*

Dominant species:—*Helix nemoralis*; associated with *Agriolimax agrestis*, *Punctum pygmæum*, *Helicella virgata*, *Theba cantiana*, *Hygromia hispida*, *H. striolata*, and *Vallonia excentrica.*

H. itala is one of the most abundant shells in the district, and *V. pygmæa* occurs practically everywhere in this type of habitat. Occasionally *Candidula gigaxii* finds a place in the association, but *C. caperata* is extremely rare, only an occasional small colony appearing. When the habitat is affected by the presence of thickets and small copses with their abundant vegetation, i.e., when it is practically Scrub, the following species can be added to the association:—*Limax maximus*, *Arion ater*, *A. hortensis*, *Helicigona arbustorum*, *Helix aspersa*, and *H. hortensis.*

A. ater here shows a great range of variation, numerous examples occurring of the following varieties:—***rufa, brunnea, plumbea, swammerdami, castanea,*** and ***fasciata. H. nemoralis*** abounds, but exhibits remarkably little variation, the shells being of but average size, with heavily-banded specimens predominating.

§ 2. *Non-Calcareous Pasture.*

Subject to the same reservation with regard to Scrub, as in the case of Calcareous Pasture, the alluvial flats of the valley of the Nene afford examples of non-calcareous pasture, the soil overlying great beds of river gravel.

Dominant:—***Arion ater***; associated with ***Agriolimax agrestis, Hyalinia nitidula, Theba cantiana, Hygromia hispida, H. striolata, Vallonia costata, Helicigona arbustorum, Helix aspersa, H. nemoralis, H. hortensis,*** and ***Cochlicopa lubrica.***

Perhaps the characteristic species of this type of habitat is ***H. arbustorum***, which is certainly dominant over the other members of the ***Helicidæ***, especially when the pasture is becoming Scrub. Also where these pastures adjoin woods, many woodland species appear in the association, e.g., ***V. pellucida, H. helvetica, H. cellaria, P. rotundata, E. obscura,*** and ***P. bidentata***, but it seems advisable to omit them from the Grassland lists and place them in their true positions.

Sub-section: Subterranean.

Cæcilioides acicula universally and abundantly distributed on both types of pasture; probably an isolated species.

B.—Wet Grasslands.

§ 1. *Marsh.*

The mollusca of the marshy margins of rivers and ponds are included under these respectively. The following association is that of a typical natural marsh, an extensive tract of boggy ground, marked by the presence of the Common Rush, Cotton Grass, Bog Bean, Marestail, and Peppermint.

Characteristic:—*Zonitoides nitidus* and *Vertigo antivertigo.*

Associated with:—***Agriolimax lævis, Hyalinia radiatula, Euconulus fulvus, Arion ater, A. minimus, Hygromia hispida, Cochlicopa lubrica, Succinea elegans, Carychium minimum, Pisidium casertanum,*** and ***P. personatum.***

V. antivertigo is found in the dampest moss among the rushes, while *E. fulvus* is extremely plentiful and of the small, strongly-striated var. *alderi.*

§ 2. *Hard-Water Ponds.*

Situated on a highly calcareous soil and fed by hard-water springs, the great majority of the ponds are of this type. They are very numerous and nearly all very small and shallow, and so subjected to great variation of temperature. Possibly this has something to do with the paucity of molluscan life in many of them. As a rule the water is clear and there is little vegetation except at the edges of the pond, and when masses of floating Water Crowfoot (*Ranunculus aquatica*) occur. The ponds on the Oxford Clay show much more vegetation than those on the Oolitic Limestone and Upper Estuarine Clays, and are proportionately more prolific of mollusca.

A typical association of the Hard-Water Pond is:—*Limnæa pereger*, *Planorbis crista*, *Sphærium corneum*, *S. lacustre*, and *Pisidium obtusale*.

L. pereger is sometimes replaced by *L. stagnalis* or (in very shallow ponds) by *L. truncatula*; but where it does occur it is the dominant species. The most constant members of the association are *P. crista* and *P. obtusale*, and when occurring they are extremely abundant. In one shallow pond is found in large numbers a form of *P. obtusale*, which Mr. Stelfox informs me approximates very closely to *Pisidium scholtzii*. I may here say that the great bulk of my collections of the Pisidia has been examined and identified by Messrs. A. W. Stelfox, R. A. Phillips, and C. Oldham, to whom my sincere thanks are due, as without their invaluable assistance the lists of aquatic species would have been very incomplete.

In these ponds occur other species more or less frequently, viz., *Planorbis fontanus*, *Velletia lacustris*, *Pisidium subtruncatum*, *P. milium*, and *P. henslowanum*. And, when the pond or one part of it is shallow and much overgrown with rushes and grasses, appear *Planorbis spirorbis*, *Aplexa hypnorum*, and *Physa fontinalis*.

In the damp margin of the pond occur some or all of the following: *Agriolimax agrestis*, *A. lævis*, *Hyalinia radiatula*, *Punctum pygmæum*, *Hygromia hispida*, *Vallonia costata*, *V. excentrica*, *Succinea putris*, and *S. elegans*.

§ 3. *Soft-Water Ponds.*

These ponds are few in number, occurring here and there in the River Alluvium. They present quite a different facies of molluscan life, far richer both in number and variety than the hard-water ponds of similar size and depth. The striking feature of the Soft-Water Pond is the predominance of *Planorbis*, especially of the larger members of the genus, while *Bithynia tentaculata* appears as a strong competitor in the associated life.

Dominant:—*Planorbis corneus* and *Bithynia tentaculata*.

Associated with:—*Limnæa pereger*, *L. palustris*, *Planorbis umbilicatus*, *P. spirorbis*, *Physa fontinalis*, *Sphærium corneum*, and *Pisidium milium*.

§ 4. *Rivers and Streams.*

The River Nene, here of some width and good depth, affords a great variety of the fresh-water species, most of them in great abundance. We can separate it into three types of habitat, each with its own association of molluca; (*a*), Open Water, the deeper parts of the river, where are the water-weeds growing from the river-bed; (*b*), Reed-Belt, where Reeds and water-plants fringe the banks; (*c*), Marsh, the rush-grown shallows and moist river-margins.

(*a*), the open water affords:—*Velletia lacustris*, *Ancylus fluviatilis*, *Limnæa pereger*, *L. auricularia*, *Planorbis albus*, *Vivipara contecta*, *Valvata piscinalis*, *Unio pictorum*, *U. tumidus*, *Anodonta cygnea*, *Pisidium amnicum*, *P. nitidum*, *P. pulchellum*, *P. supinum*, and on stones and stone-work of locks and bridges *Neritina fluviatilis* and *Dreissensia polymorpha*.

(*b*), the Reed-Belt affords:—*Limnæa palustris*, *L. stagnalis*, *Planorbis corneus*, *P. umbilicatus*, *P. spirorbis*, *P. vortex*, *P. fontanus*, *P. contortus*, *Physa fontinalis*, *Bithynia tentaculata*, *B. leachii*, *Valvata cristata*, *Sphærium corneum*, *Pisidium milium*, and *P. subtruncatum*.

(*c*), the Marsh affords:—*Agriolimax agrestis*, *A. lævis*, *Hyalinia radiatula*, *Arion ater*, *A. minimus*, *Vallonia pulchella*, *Succinea putris*, *S. elegans*, *Carychium minimum*, *Limnæa truncatula*, *Pisidium henslowanum*, and *P. casertanum*.

There are also two small rivers which touch the district; swift, shallow streams with deeper pools. They are by no means so rich in mollusca. Open Water:—*Limnæa pereger*, *Valvata piscinalis*, and *Unio pictorum*. Reed-Belt:—*Planorbis umbilicatus*, *P. spirorbis*, *Sphærium corneum*, *Pisidium nitidum*, *P. casertanum*, *P. milium*, *P. subtruncatum*, and *P. henslowanum*: and in one case *Pisidium hibernicum*.

The many small brooks contain as a rule an abundance of *Limnæa pereger*, often without any other species.

The association appears to be:—

Dominant. *Limnæa pereger*: with (fairly constantly) *Sphærium corneum* and *Pisidium subtruncatum*: and (occasionally) *Limnæa truncatula* and *Planorbis spirorbis*.

C.—Woodlands.

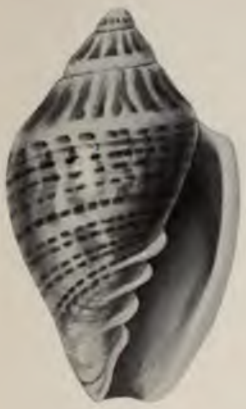
The natural woodlands of England may be roughly divided into three great series:—

I.—The Alder-Willow Series (on very damp soils).

II.—The [illegible] ch Series (on siliceous soils).

[illegible] h Series (on calcareous soils).

be continued.



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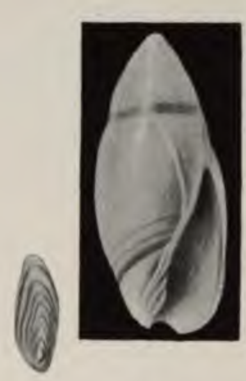

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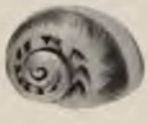

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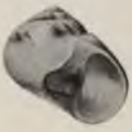

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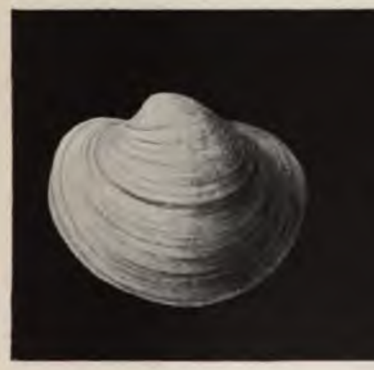

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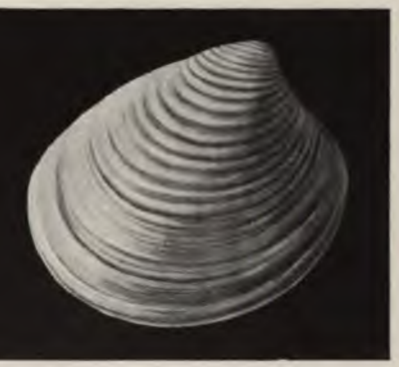

6

R. Green *del.* 1, 5, 6.
J. D. Dean ,, 2, 3, 4.

See p. 215. FIG. 1.—*Marginella epipolia* n.sp.
,, 2.—*Ancilla errorum* n.sp. and operculum.
,, 3, 4.—*Natica aureozona*, n.sp.
,, 5.—*Cryptodon eutornus* n.sp.
,, 6.—*Clementia mcclellandi* n.sp.

THE

JOURNAL OF CONCHOLOGY.

VOL. 16. JANUARY, 1922. No. 8.

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Adams, J. H., Bedwyn, Wilts.
Arnold, B., Milton Hall, Milton-next-Gravesend, Kent.
Bacchus, D., 29, Abbotsford Road, Redland, Bristol.
Cartwright, W., M.Sc., 18, Bath Road, Buxton.
Collinge, Dr. W. E., The Museum, York.
Cribb, Rev. C. T., B.A., Chatsworth House, Regent Street, Leamington.
Despott, G., C.M.Z.S., M.B.O.U., Valletta, Malta.
Eliot, Sir Charles, c/o British Embassy, Tokio.
Emmett, H., Grove Cottage, Hammersley Street, Hanley, Stoke-on Trent
Firth, J. D., The Crescent, Hyde Park Corner, Leeds.
Gauntlett, H. L., Formby, Brockenhurst, Hants.
Hargreaves, J. A., 11, Garden Street, Leeds.
Hindley, R. T., Oakenclough, near Huddersfield.
Lancaster, E. le Cronier, Venaway, Parkmill S.O., Glamorgan.
Newton, R. Bullen, I.S.O., 328, Uxbridge Road, London, W. 3.
Pye, A. W., The Hollies, Dudley Street, Grimsby.
Roberts, A. W. Rymer, The End House, 38, Fulbrook Road, Cambridge.
Simpson, James, 23, Marischal Street, Aberdeen.
Sowden, H., 22, Victoria Street, Nunnery Lane, York.
Stracey, B., Châlet Dunbeg, Diemtigen, Simmenthal, Canton Bern, Switzerland.
Turton, Lt.-Col. W. H., 21, Sion Hill, Clifton, Bristol.
Van der Sleen, Dr. W. G. N., Laurens Cortes-straat, 23, Haarlem, Holland.
Worsfold, H. W., 168, The Grove, Wandsworth, London, S.W. 18.

The New Members, Resignations, Deaths, etc., will be found in the Proceedings, pp. 159-164, 234 and 268-275.

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Helix aspersa var. **exalbida at Westbury-on-Trym, Glos. W.**—At a corner of an allotment here, on a wall ivy-clad for about twenty yards, there is quite a numerous colony of the above. As far as my investigation goes at present the "aspersa" population here may be divided into three—about one-third var. *exalbida* ; one-third type, well banded but ground colour more yellow than usual, and one-third a reddish brown shell. The interior and inside of lip a purple colour. This is not the first record of var. *exalbida* for the county, for in 1874 the Misses Hele found it at Westbury-on-Trym. (Leipner, L. & F. W. Mollusca of Bristol District, 1876). If this is the same habitat I thought it might be of interest, as showing the variety to have flourished for nearly 50 years. Among the nettles below I have taken *Polita draparnaldi*, *H. striolata*, type and var. *alba*. On the grass bank below *H. virgata* type, var. *lutescens* (normal size), var. *albicans* and var. *hyalozona*, small but fairly common, *H. caperata* of a large size and var. *fulva* and *C. lubrica*.—DOUGLAS BACCHUS (*Read before the Society*, November 10th, 1920).

OBITUARY NOTICE: REV. CANON J. W. HORSLEY, M.A.

By J. R. le B. TOMLIN, M.A.

It is with great regret that we record the death of another of our senior members, Canon Horsley, at Kingsdown, near Deal, on November 25th last.

John William Horsley was the eldest son of the Rev. J. W. Horsley, nephew of the Royal Academician J. C. Horsley, and cousin of Sir Victor Horsley.

He was born in 1845, educated at King's School, Canterbury, and Pembroke College, Oxford, and ordained in 1870 by Bishop Mackarness at Oxford.

In 1874 he went as curate to a church in Shoreditch, and spent most of the rest of his active career in close connexion with the poorest side of London life. He was for about ten years chaplain of Clerkenwell Gaol, vicar of Holy Trinity, Woolwich, for six years, rector of S. Peter's, Walworth, for seventeen years, and in 1911 accepted the living of Detling, near Maidstone. He was a Freemason of high standing and deeply versed in Masonic lore. He devoted much time and energy to a perennial crusade against the overcrowding and insanitary conditions of life amongst the poor, was a constant advocate of country holidays for poor children, and for many years personally conducted parties of parishioners to Meiringen in Switzerland, where his interest in natural history proved an invaluable asset.

Horsley was elected a member of our Society on 3rd June, 1891, and served as President in 1911-12: he contributed regularly to the *Journal of Conchology*, mainly short faunistic notes. As a collector he confined his attentions to the *Helicidæ*, and his shells and cabinets were sold at Stevens' Rooms on October 18th last.

He married the eldest daughter of Captain Codd, Governor of Clerkenwell Gaol, and leaves two sons and three daughters surviving.

The key to his life is contained in a remark he once made that "no man can be a good Christian who is not also a good citizen," and he carried out this principle with a cheery enthusiasm and a persistent optimism that were beyond all praise.

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THE MOLLUSCA OF OUNDLE.

BY THE REV. C. E. Y. KENDALL, B.A.

(Read before the Society, February 12th, 1919)

(Concluded from p. 244).

Woodlands of the second series are of course wanting here. There is a certain amount of woodland of the first series, while the great bulk of the woods belongs to the third series. This series may be sub-divided into three types —(*a*), Ash-Oak Wood; (*b*), Pure Ash Wood; (*c*), Beech Wood. Of these types there is no Pure Ash Wood and very little Beech Wood, but of the Ash-Oak Wood type there is a very great area and that is certainly natural and indigenous to the soil. Probably there is no primitive woodland, i.e., woods untouched by human agency from time immemorial, but certainly the whole of the Ash-Oak is natural and the successor of many generations of such woodland on the same area; for in ancient days Rockingham Forest covered the whole of the north-western part of the county of Northampton, and many of our woods are remaining fragments of it. The characteristic tree of the whole district is the Ash (*Fraxinus excelsior*) which is dominant, appearing everywhere in abundance in woods, fields and hedgerows. The oak natural to the district is the pedunculate oak (*Quercus pedunculata*). In all the woods the Ash is mostly coppiced, being of great value in the workshop, while the oaks are left to grow as "standels" until their timber chances to be needed. In the majority of the woods there is a great amount of Hazel (*Corylus avellana*), also commonly coppiced. The Beech Wood belonging to this same series is really indigenous on the chalk, whether that in this district is natural or artificial is very hard to say, but such woodland is found natural on the Oolite in the south-west of England. No account is taken in this paper of purely artificial woods formed by the planting of various trees for timber or preservation of game.

§ 1. *Alder-Willow Woodland.*

There is no great development of this type, but here and there along the river-side small patches of it, composed largely of Willow with a certain amount of Alder. The soil in these woods is exceedingly damp, often flooded, and usually with pools and rivulets draining into the river.

Characteristic:—*Zonitoides nitidus* and *Succinea elegans*.

Associated with:—*Agriolimax laevis*, *Hyalinia cellaria*, *H. radiatula*, *Euconulus fulvus*, *Hygromia hispida*, *Vallonia costata*, *Cochlicopa lubrica*, *Carychium minimum*, and *Pisidium personatum*.

§ 1. a. *Osier Beds.*

This type of woodland, a very noticeable feature of the landscape, is included in the Alder-Willow Series. Examples are found frequently along the course of the river, some in use and regularly cleaned and harvested, while others consist of ragged clumps of trees which have sprung from the old stools. Being practically at river-level, they are all liable to flooding and permanently moist. Very rich in molluscan life, they have their own peculiar association.

Characteristic :—*Agriolimax lævis* and *Zonitoides nitidus.*

Dominant :—*Arion ater.*

Associated with :—*Agriolimax agrestis*, *Hyalinia crystallina*, *H. nitidula*, *H. radiatula*, *Z. excavatus*, *Euconulus fulvus*, *Arion minimus*, *A. circumscriptus*, *Hygromia hispida*, *Pyramidula rotundata*, *Cochlicopa lubrica*, *Pirostoma bidentata*, *Succinea putris*, and *S. elegans.*

A comparison of these two lists with that of B § 1. *Marsh* suggests that in some cases the water-content of the soil is the determining factor in the association, rather than the presence or absence of lime or the particular kind of flora.

§ 2. *Ash-Oak Woodland.*

The prevailing type of woodland, indigenous and natural to the Calcareous Clays, is the Ash-Oak. The summits and upper slopes of the undulating hills are clothed with them, often woods of great extent. They consist of large Oaks (*Quercus pedunculata*) of all ages and of coppiced Ash and Ash saplings, in most cases mingled with coppiced Hazel. The ground flora is rich and varied, owing to the calcareous nature of the deep moist soil and comparatively abundant light, for the Oaks are generally too far apart to form a dense canopy. Probably the influence of the ground flora on molluscan life is inappreciable, but the abundance of moss and prevalence of fungi, upon which many species actually feed, certainly affect it. All the woods would be described as "damp" woods, i.e., woods with a deep soil with high water-content. They are all rich in mollusca, both with regard to number of species and of individuals.

There are a few woods which show a considerable amount of Birch (*Betula tomentosa*), probably planted by substitution for the natural trees which have been felled. They show a similar facies of molluscan life, though not so rich. The average Ash-Oak wood here affords the following association of species :—

Characteristic :—*Hyalinia helvetica*, *Azeca menkeana* and *Marpessa laminata.*

With :—***Limax arborum*, *Agriolimax agrestis*, *Vitrina pellucida*, *Hyalinia crystallina*, *H. cellaria*, *H. nitidula*, *H. pura*, *Euconulus fulvus*, *Arion ater*, *A. subfuscus*, *A. minimus*, *A. hortensis*, *Punctum pygmæum*, *Pyramidula rotundata*, *Hygromia hispida*, *Acanthinula aculeata*, *Helix nemoralis*, *Ena obscura*, *Cochlicopa lubrica*, *Pirostoma bidentata*, *Lauria cylindracea*, *Carychium minimum***, and in very damp places, where pools of water usually stand, ***Agriolimax lævis*** and *Limnæa truncatula.*

Here also is the true position of *Cyclostoma elegans*, but so far careful search has failed to reveal it within the limits of the district, though it occurs frequently in this type of woodland on exactly similar soil just outside them. Here some unknown factor is evidently at work, as the same applies to the two Xerophiles, *C. caperata* and *C. gigaxii*, which become far more numerous just to the north of the district.

§ 2. a. *Beech Wood.*

Of Beech Woods there is but one in the district, a large wood of magnificent trees, purely Beech, lying on a steep slope arising from the river and forming one of the "beauty spots" of the neighbourhood. The trees are finely grown, and form the dense canopy peculiar to a typical Beech wood. The soil is a deep moist calcareous clay, clothed with Dog's Mercury (*Mercurialis perennis*) to the almost complete exclusion of every other plant, while fungi abound on fallen trees and decaying trunks. This wood has probably been planted out a long time ago, as it seems to be unique.

Dominant :—*Limax arborum*, *L. maximus*, and *Arion subfuscus.*

Associated with :—*Vitrina pellucida*, *Hyalinia crystallina*, *H. cellaria*, *H. alliaria*, *H. nitidula*, *H. pura*, *Euconulus fulvus*, *Arion minimus*, *A. hortensis*, *Punctum pygmæum*, *Pyramidula rotundata*, *Hygromia hispida*, *Acanthinula aculeata*, *Vallonia costata*, *Helicigona arbustorum*, *Ena obscura*, *Cochlicopa lubrica*, *Lauria cylindracea*, *Marpessa laminata*, *Pirostoma bidentata*, and *Carychium minimum.*

LIST OF MOLLUSCA OCCURRING IN THE OUNDLE DISTRICT.

In all ninety-five species.

Limax maximus, * *L. flavus*, *L. arborum*, *Agriolimax agrestis*, *A. lævis*, **Milax sowerbyi*, *Vitrina pellucida*, *Hyalinia crystallina*, *H. cellaria*, *H. helvetica*, *H. alliaria*, *H. nitidula*, *H. pura*, *H. radiatula*, *Zonitoides nitidus*, *Z. excavatus*, *Euconulus fulvus*, *Arion ater*, *A. subfuscus*, *A. minimus*, *A. hortensis*, *A. circumscriptus*, *Punctum*

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* Occurring in "artificial" habitats, i.e., due to human agency, such as gardens and stone walls.

pygmæum, [*]*Pyramidula rupestris*, *P. rotundata*, *Helicella virgata*, *H. itala*, *Candidula caperata*, *C. gigaxii*, *Theba cantiana*, *Hygromia hispida*, *H. striolata*, *Acanthinula aculeata*, *Vallonia costata*, *V. pulchella*, *V. excentrica*, [*] *Helicigona lapicida*, *H. arbustorum*, *Helix aspersa*, *H. nemoralis*, *H. hortensis*, *Ena obscura*, *Cochlicopa lubrica*, *Azeca menkeana*, *Cæcilioides acicula*, *Pupilla muscorum*, *Lauria cylindracea*, *Vertigo antivertigo*, *V. pygmæa*, [*]*Balea perversa*, *Marpessa laminata*, *Pirostoma bidentata*, *Succinea putris*, *S. elegans*, *Carychium minimum*, *Ancylus fluviatilis*, *Velletia lacustris*, *Limnæa auricularia*, *L. pereger*, *L. palustris*, *L. truncatula*, *L. stagnalis*, *Planorbis corneus*, *P. albus*, *P. crista*, *P. umbilicatus*, *P. vortex*, *P. spirorbis*, *P. contortus*, *P. fontanus*, *Physa fontinalis*, *Aplexa hypnorum*, *Bithynia tentaculata*, *B. leachii*, *Vivipara contecta*, *Valvata piscinalis*, *V. cristata*, *Neritina fluviatilis*, *Dreissensia polymorpha*, *Unio pictorum*, *U. tumidus*, *Anodonta cygnea*, *Sphærium corneum*, *S. lacustre*, *Pisidium amnicum*, *P. casertanum*, *P. nitidum*, *P. personatum*, *P. milium*, *P. pulchellum*, *P. subtruncatum*, *P. henslowanum*, *P. supinum*, *P. hibernicum*, and *P. obtusale*.

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Valvata macrostoma in Cambridgeshire.—This species is not uncommon in the drains which intersect the fields within the containing embankments of the Great Ouse at Ely, where I collected the specimens exhibited, on March the 26th, 1921. The drains are choked with vegetation, *Nasturtium officinale*, *Apium nodiflorum*, *Hottonia palustris*, *Myosotis palustris*, *Alisma plantago*, *Elodea canadensis*, *Carex paludosa*, *etc.*, and support a varied molluscan fauna. The species found in association with *V. macrostoma* were *Succinea putris*, *Limnæa pereger*, *L. stagnalis*, *L. palustris*, *Planorbis vortex*, *P. contortus*, *P. marginatus*, *P. corneus*, and var. *albinos*, *Segmentina nitida*, *Physa fontinalis*, *Valvata cristata*, *Viviparus contectus*, *Bythinia tentaculata*, *B. leachii*, and *Sphærium corneum*.—CHAS. OLDHAM (*Read before the Society*, Sept. 7th, 1921).

Physa fontinalis new to Selkirkshire.—While cycling past St. Mary's Loch, Selkirkshire, on the 1st October, 1921, I descended to the edge of the Loch on the West side. The point selected was, unfortunately, almost barren of molluscan life, this no doubt being due to the bare stony nature of the bed of the Loch, so that after close upon an hour's search I found myself with only three specimens of *P. fontinalis*, one of *L. pereger*, and one of *A. fluviatilis*. On referring to the recently published Census I noted that *P. fontinalis* had not previously been recorded from Selkirkshire. I have, therefore, pleasure in recording this addition to the list.—E. CRAPPER (*Read before the Society*, Nov. 2nd, 1921.

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[*] Occurring in "artificial" habitats i.e., due to human agency, such as gardens and stone walls.

NOTES ON THE NON-MARINE MOLLUSCA OF MORTEHOE. No. 4.

By M. JANE LONGSTAFF, F.L.S., F.G.S.

(Read before the Society, January 14th, 1920).

SINCE my last communication in January, 1912, I have not been able to do much collecting in this district, and the additions to previous lists consist chiefly of varieties which are perhaps worth recording for the sake of making the record as complete as possible.

Helicella virgata (Da Costa) var. near *maritima* Drap.

Var. **minor** (Taylor) (**albicans** Grat.) Also a monstrosity (var. *albicans*) with the earlier part of the spire raised and partially detached from the body-whorl. These were all found on the Golf Links, Woolacombe, and were examined by the late Mr. W. D. Roebuck.

Clausilia bidentata (Ström) var. **albina** Moq.—Garden wall, Twitchen, Mortehoe.

Acicula lineata (Drap.).—Ossaborough, Mortehoe, among dead leaves in a wood. This record is interesting on account of its being only the second specimen taken in the parish.

Sphærium lacustre (Müll.).—Pond in Gratton Quarry (a field name). In September, 1909, I found but two specimens here though I searched for some time. I did not go there again till June, 1918, and then I noticed that the species had multiplied considerably, being very abundant both in the pond itself, and also on the mud left damp at the edge by the shrinkage of the water. None of the shells were as large as those previously taken. I sent some examples to Mr. J. W. Taylor and he stated that he considered them to be the "variety *ryckholtii* (Norm.) though possibly not perfectly characteristic." The umbos are not so large as in the specimens of this variety from Damage pond. Gratton is separated from the latter by higher intervening land, and while Damage has a stream running through it, Gratton is a mere quarry pit with neither inlet or outlet. At my first visit I did not observe any other molluscs associated with this species, but this time I found *Limnæa truncatula* (Müll.) in numbers.

A Colony of Limax flavus var. **tigrina** Pini, **at Reigate.**—During the last few weeks numerous examples of this striking form have appeared in my scullery at Reigate, having entered by the sink pipe. The markings are typically black, and form a continuous line on each side of the mid dorsal surface which is clear yellow, but the dark colouration varies in intensity in different individuals from black to the normal typical grey. In the same colony the markings typically distributed vary in different individuals from black to the typical grey. Some individuals answer to the description of var. *umbrosa*, Philippi.—LIONEL E. ADAMS (*Read before the Society*, November 2nd, 1921).

NOTE ON GIBBULA PENNANTI Philippi.

By Lt.-Colonel A. J. Peile, R.A.

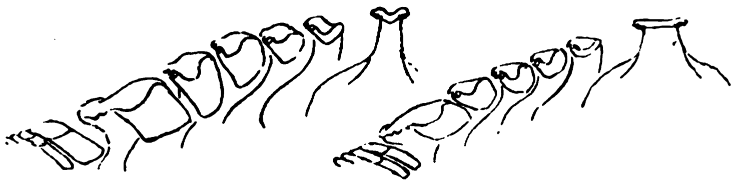
(Read before the Society, November 2nd, 1921).

Through the kindness of Mr. J. R. le B. Tomlin I have recently had the opportunity of investigating the radulæ of *Gibbula umbilicalis* and *G. pennanti* from Guernsey.[1]

The radulæ of three individuals of each species have been mounted. In each set the three radulæ agree absolutely with one another.

There are distinct differences between the two sets which, coupled with the differences in shell character, should, in my opinion, qualify *pennanti* for specific rank.

The most noticeable difference is in the outline of the centre tooth, which in *pennanti* has a top like a flattened "ace of hearts" with a slender neck below it, whereas in *umbilicalis* it is broad and almost flat with a broader neck. The backs of the five laterals also in *pennanti* are more curved and the cusps are more pointed than in *umbilicalis*. An attempt to show the salient differences is made in the appended sketches which show, in each case, the central, the five laterals on one side and the first two of the many marginals.



G. pennanti × 110   G. umbilicalis × 110

The specimens figured will be deposited in the British Museum.

The radulæ of *G. magus* L., *divaricata* L. and *cineraria* L. have a closer resemblance to that of *umbilicalis* Da. C. than to that of *pennanti* Phil.

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[1] Tomlin in *J. of Conchology*, vol. 16, p. 236.

A MONSTROSITY OF MACTRA STULTORUM Linné.

By Dr. W. G. N. VAN DER SLEEN.

(Read before the Society, February 9th, 1916).

In the course of the last three years I have frequently come across specimens of *Mactra stultorum* L. whose shell showed a very abnormal form. When finding an empty shell of this form the first time, I instantly compared it with *Mya truncata*, but this comparison is false in so far as the opening in the *Mactra* shell was not in the place of the sipho, but allowed the foot to be protruded without opening the shell.

Another stroll along our sandy beach brought me half-a-dozen specimens of the sought form and all of them still contained the animal. As far as I could find out, the animal was quite normal; only in one individual I found a small specimen of *Pinnotheres pisum*, which was, according to the literature in my possession, until now not found in *Mactra stultorum*. As the reason of the abnormality seems not to lie in the animal, I have tried to find it in its surroundings. When a young specimen of *Mactra stultorum* lives near our sandy coast, it will have hard work not to be buried so far under the sand, that this might be its cause of death. On the other hand, when living in the top of a sand-bank, it will want all the strength of its foot not to be swept off by the waves or tides. In a few words, the normal attitude of the animal will be to have the foot quite extended, and when now the growing of the shell goes on, it will form a shell with a large opening for the protruded foot. Specimens, however, that live in quiet, deeper water not so near the coast will generally have the foot quite inside the shell, and so form shells that are quite closed.

If in the period of shell-forming the animal is first in the range of the quickly-moving sand, and afterwards comes into deeper, more quiet regions, where the foot need not be always protruded, the shell generally gets closed again in short time, a bubble naturally staying on each valve.

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SOME REMARKS ON THE CAPE MARINE PROVINCE.

By J. R. le B. TOMLIN, M.A., F.E.S.

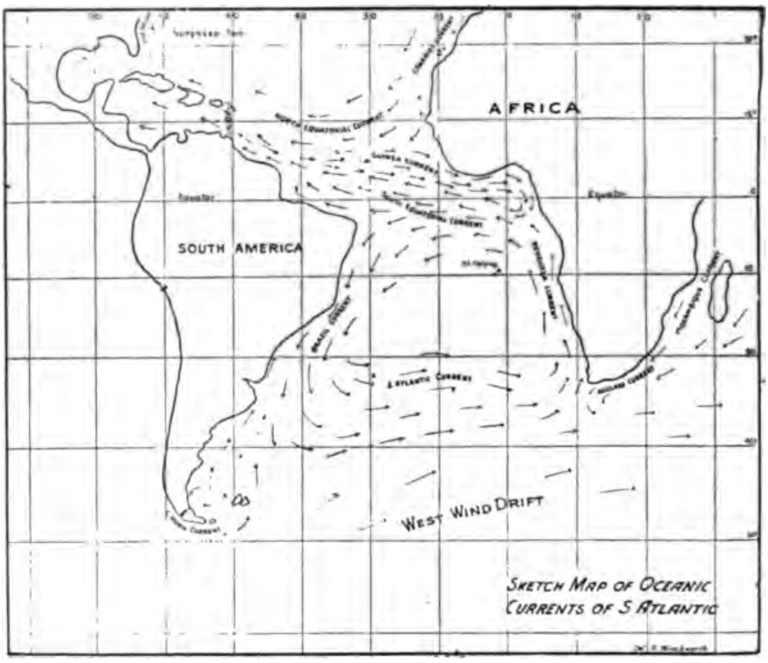
(Presidential Address delivered at the Annual Meeting, October 15th, 1921).

The coast of what is now the Union of South Africa stretches roughly for some two thousand nine hundred miles between its Portuguese neighbours on the east and west. It will probably be found eventually that as a zoological province its limits tally pretty closely with its political frontiers, and I propose in this address to put some details together which bear on these limits as far as the mollusca are concerned.

Owing to geographical position the marine fauna of the Cape is more than usually interesting and the influence of currents more than usually important. On the eastern side the Mozambique and Agulhas currents bring a fairly plentiful admixture of well-known tropical shells from the Indian Ocean down the coasts of Zululand and Natal —of *Conus* such as *lividus* and *hebræus*, of *Strombus* such as *gibberulus*, of *Cypræa* such as *lynx* and *erosa*, of *Nerita* such as *polita* and *albicilla*, and of bivalves such as *Cardita variegata* and *Tapes textrix*. Probably Durban is pretty nearly the farthest limit of these invaders. In this connexion, I may mention that *Cypræa tigris* was taken alive for the first time in South African waters at Scottburgh, three years ago. So many species are known from this province only in a dead or more or less worn condition that it is extremely hard to determine what part ballast plays in the introduction of novelties. It is certainly a factor which must not be overlooked.

On the western or Atlantic side flows the comparatively cold Benguela Current, which, after sweeping eastwards from South America as the South Atlantic Current, reaches the African shores in the neighbourhood of the Cape Peninsula and washes up the west coast towards the equator. It again crosses the ocean, this time westwards, and bifurcates off South America, part following the north coast to the West Indies as the South Equatorial Current, and part flowing southwards from Cape S. Roque as the Brazil Current, thus effectually preventing the transference of mollusca or indeed of any pelagic life from the West Indies to South Africa. The occurrence of a number of West Indian shells in and about the Gulf of Guinea is due to a counter current, which runs eastward in the neighbourhood of the equator, between the cyclonic systems of the North and South Atlantic. At a certain time of year when the sun is well south of the line the whole system shifts further south, and the Benguela Current then impinges on S. Helena, which for the greater part of the year is in the central still area. This accounts for the occurrence of certain [1] Cape shells on the island, e.g. *Mitra simplex* Dkr., *Murex purpuroides* Dkr., *Columbella kraussii* Sow. and *Gadinia costata* Krs., which have drifted on weed from the Cape where they are endemic. They cannot be considered members of the S. Helena fauna.

The trend of the Atlantic currents should make us very chary of admitting palæarctic species to the S. African list. Now in the *Journ. of Conch.* vi, p. 147 Sowerby wrote :—"One thing struck me as remarkable and that is the number of British and European species found on the South African coast." and again "the list contains altogether 34 species known to inhabit European waters." It is not quite easy to determine which are the 34 species, but probably the following (names as given by Sowerby) :—



SKETCH MAP OF OCEANIC CURRENTS OF S ATLANTIC

Argonauta argo L.
**Pseudomurex meyendorffi* Calc. = *Coralliophila fritschi* Mts.
**Triton cutaceus* L. = *Cymatium africanum* A. Ad.
Triton nodiferus Lam.
**Triforis perversa* L. = *Triphora africana* Bartsch.

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[1] Smith, *Mar. Moll. S. Helena*, *P.Z.S.*, *1890*, *p. 247*.

*_Siliquaria anguina_ L. = _S. wilmanæ_ Tomlin.
Ovulum spelta L.
Ovulum carneum Poiret.
*_Turbo sanguineus_ L. = _Leptothyra carminea_ Bartsch.
Cerithium vulgatum Brug.
*_Cerithium contractum_ Sow. = _C. pingue_ A. Ad.
Trochita chinensis L.
*_Fissurella neglecta_ Dh. = _F. spreta_ Smith.
Philine aperta L.
Cylichna umbilicata Mont. = _Retusa truncatula_ Brug.
Aplysia punctata Cuv.
*_Chiton marginatus_ Penn. = _Ischnochiton elizabethensis_ Pilsbry.
*_Tellina calcarea_ Ch. = _T. littoralis_ Krs.
*_Tellina cumana_ Hanley. = _T. africana_ Sow.
Psammobia vespertina Gm.
Venus verrucosa L. var. _capensis_ Sow.
*_Arca lactea_ L. = _A. gibba Krs._
*_Lucina lactea_ L. = _Loripes clausus_ Ph.
*_Lutraria oblonga_ Ch. = _L. capensis_ Rve.
*_Solen marginatus_ Pult. = _S capensis_ Fischer.
Solen pellucidus Penn.
Ceratisolen legumen L.
Saxicava arctica L.
*_Cardium fasciatum_ Mont. = _C. turtoni_ Sowerby.
Nucula radiata F. & H.
*_Modiola petagnæ_ Sc. = _Modiolaria capensis_ Krs.
*_Modiola discors_ L. = _M. cuneata_ Gld.
*_Mytilus edulis_ L. = _M. meridionalis_ Krs.
*_Pecten pusio_ L. = _P. tinctus_ Rve.

Nineteen of these (*) have subsequently proved to be wrong identifications and the correct equivalents are given in the second column.

Aplysia punctata is not recognised by Bergh in his comprehensive[1] "Opisthobranchiata of S. Africa" and probably Sowerby's record is based on the inadequate evidence of the shell alone. It may well have been one of Bergh's new species.

Krauss called the Cape _Triton sauliæ_ Rve: the identity or otherwise of _T. nodiferus_ and _T. sauliæ_ is still unsettled.

Six of the remainder, viz., _O. spelta_ L., _O. carneum_ Poir., _C. vulgatum_ Brug., _P. vespertina_ Gm., _S. pellucidus_ Penn. and _C. legumen_ L. are more than doubtful, but I have not seen specimens.

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[1] Trans. S. A. Phil. Soc., xvii. 2.

The identity of the big Cape *Philine* with our familiar British species is unlikely, though Bergh (l.c. p. 26) is inclined to unite them "in spite of some differences." I have little doubt that further investigations will confirm these differences and it seems better provisionally to separate them. The Linnean name ***aperta*** belongs indisputably to the Cape shell—[1]Linné says "Habitat ad Cap. b. spei (Laur. Spengler)"—and the British species should be called [2]*P. schrœteri* Phil.

This reduces the list of 34 species to six, one of which, ***A. argo*** L. is pelagic, but I fully expect that the shell listed as *Trochita chinensis* L. will prove distinct from its European analogue when its soft parts have been studied. Similarly the naming of *Nucula radiata* F. & H. (i.e. *nucleus* L.) is purely tentative, as at present it is only known from worn valves.

[3]Smith had reason to believe that Sowerby's *Cylichna umbilicata* was a misnomer for *Retusa truncatula* Brug. We have, therefore, three species left, *Retusa truncatula* Brug., *V. verrucosa* L. and *Saxicava arctica* L., which certainly seem—as far as one can judge from shell characters—to be common to Britain, the Mediterranean and S. Africa. Sowerby proposed a var. *capensis* for the Cape *V. verrucosa*, but I see no object in perpetuating this name; specimens in all stages of growth seem indistinguishable from those found in the Channel Islands.

[4]Fischer is, therefore, correct in saying that the European species found at the Cape are very few: he instances *Lasæa rubra* and *Pecten pusio*, the latter being an error of identification for *P. tinctus* Rve. Bartsch has recently described the Cape *Lasæa* as a new species (*L. turtoni*) distinct from *rubra*.

This analysis of Sowerby's statement will serve as an object lesson on the difficulties which attend the naming of Cape marine shells. These difficulties are mainly due to the "deadness" of much of the available material. Probably no beaches are richer than some of the Cape ones—witness the famous Port Alfred shore from which Col. Turton has gathered over 800 species at the very least within a stretch of ten miles. But most of these are beach-rolled, and it is no exaggeration to say that a considerable proportion of the species on the S. African list has never been seen alive; some of the quite well-known bivalves, especially minute forms belonging to such genera as *Rochefortia*, *Carditella* and *Hochstetteria*, are still only known from single valves. The consequence is that when perfectly fresh or live shells do turn up, they are liable to be described over again as new. The paucity of live examples is due to the fact that so many of these small molluscs, Turrids, Columbellids, Marginellids and many others, live just below low-water on ground where dredging is impossible, owing to the continuous heavy surf.

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[1] S. N. ed. xii, p. 1183.

[2] Enum. Moll. Sic., ii, 94.

[3] J. Malac., xi, 38.

[4] Man. Conch., 155.

At the present day we know enough of the Cape fauna to be able to say that it has a very large total of endemic species. Fischer estimates the proportion as fifty per cent., but it is probably much higher. In the past almost every marine province seems to have been drawn upon to supply specific names for the Cape list, and though a certain amount of purging has been accomplished, it is still cumbered with these aliens, of whom the great majority will have eventually to be recommended for deportation. Few special genera are hitherto recognised, but further study will inevitably tend to add largely to their number: for instance, [1] Cooke has recently demonstrated that the Cape Cominellas fall into two groups, both very distinct from the Australasian forms which have so far been considered congeneric. Similar segregation may be expected or has already been outlined for the Cape species in such well-represented groups as *Triphora*, *Columbella*, *Marginella*, *Ancilla*, *Patella*, *Fissurella* and the *Turridæ*.

I have already alluded to the productiveness of certain localities, but there are only a few at which methodical collecting has been done. In older literature one seldom finds a more exact locality than "Cape." The publication of Krauss' "Südafrikanischen Mollusken" in 1848 marks the beginning of a new epoch, and more recently a succession of collectors, including Layard, Bairstow, Burnup, Alexander, Lightfoot, Quekett, Farquhar, Becker, Turton, Kincaid, McClelland, Falcon, Mullens, Frames and Mrs. Howard, and the writings of Bergh, Sowerby and Smith have furnished a mass of data, mainly from but a few foci, the chief of which are Durban, Port Alfred, Port Elizabeth, Port Shepstone and the Cape Peninsula. From these sources we can now get a very fair idea of distribution on the eastern side of the province. Delagoa Bay seems to have a preponderating admixture of Indian Ocean mollusca, and it is probably just south of this that the endemic Cape element becomes dominant.

On the west side, however, there is an enormous stretch of coast line, little short of 1,400 miles, from which we have but isolated scraps of information. Between Cape Town and the Orange River we glean some scanty records from [2] Martens and [3] Bartsch.

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[1] Proc. Mal. Soc., Lond., xii, 227.

[2] Wiss. Ergebn. Tief—See Exp., vii, Lief. 1, p. 52.

[3] U. S. Nat. Mus. Bull., 91.

I have thought it worth while to collect the records published for the coast of what was German S. W. Africa, and in this connexion I will first list a small collection from Lüderitz Bay, recently received from the Kimberley Museum :—

Conus tinianus Brug.
Clionella sigillata Rve.
Thais cingulata L.
Thais squamosa Lam.
Thais wahlbergi Krs.
Cominella papyracea Brug.
Cominella lagenaria Lam.
Cominella limbosa Lam.
Pollia carinifera Kstr.
Bullia digitalis Dillwyn.
Bullia lævissima Gm.
Fasciolaria lugubris Rve.
Mitra picta Rve.
Argobuccinum argus Gm.
Littorina knysnaënsis Krs.
Crepidula hepatica Dh.
Oxystele variegata Ant. (*impervia* Mke.)
Oxystele capensis Gm.
Patella granularis L.
Patella morbida Rve.
Patella miniata Born.
Patella compressa L.
Patella pruinosa Krs.
Siphonaria variabilis Krs.

To the above may be added the following six species recorded by Martens from Angra Pequena, which is practically the same locality :—

Bullia callosa Wd.
Bullia sulcata Rve.
Fissurella mutabilis Sow.
Patella granatina L.
Patella plicata Born. (= *barbara* L.)
Helcion pectunculus Gm.

The above 30 species form a representative list of characteristic Cape shells. Martens records the following from Walvis (Walfisch) Bay :—

Cominella lagenaria Lam.
Cominella limbosa Lam.
Alectrion plicatella A. Ad.
Marginella labrosa Redf.
Oxystele variegata Ant.
Patella granatina L.
Patella argenvillei Krs.
Patella sanguinans Rve.
Patella granularis L.

To these I can add *Marginella capensis* Krs. and *M. walvisiana* Tomlin (described *J. of C.*, xvi, 88) received from Mr. Burnup during the war. This list, though small, is interesting and important, as it shows the first signs of West African influence by the occurrence of *M. labrosa*, a Gulf of Guinea shell which occurs also in the West Indies. *Alectrion plicatella* is common in the Mossamedes region, though it is also recorded from Natal. It was originally described from Wallwich (sic) Bay.

The next point, going northward, from which I can glean any records is Great Fish Bay, which I assume to be identical with Baie des Tigres of the French, a locality in Portuguese territory :—

Conus gradatulus Wkff.
Clavatula tripartita Smith (i.e. *bipartita* Wkff.)
Pseudoliva plumbea Dillwyn.
Cymatium costatum Born.
Natica fulminea Gm.
Natica fanel Récluz.
Sigaretus concavus Lam.
Mytilus pictus Born.
Dosinia orbignyi Dkr.
Donax rugosus L.

The W. African element has here become predominant. The Cone is a deep water form which has been dredged several times off Cape Agulhas and in the Agulhas Current.

Mossamedes is about 100 miles N. of Gt. Fish Bay, and from here onwards our knowledge rests upon much more extensive and adequate data. In recent years Dautzenberg has given us two works of the highest importance on geographical distribution, both of them reports on the collections of Prof. A. Gruvel, who made several expeditions to the W. African coast between 1905 and 1910, and dredged systematically at many points between the Baie du Lévrier and Mossamedes.

In these [1] reports the following species are recorded from various localities from Mossamedes northwards and are also ascribed to the Cape province :—

Retusa truncatula Brug.
Philine aperta L.
Terebra grayi Sow.
Clavatula tripartita Smith (i.e. *bipartita* Wkff.)
Clavatula lineata Lam.
Imbricaria carbonacea Hinds.
Nassa poecilosticta Smith (= *quantula* Gld.)
Dorsanum callosum Gray.
Cymatium costatum Born.
**Triforis perversa* L.
Littorina angulifera Lam.
**Littorina punctata* Gm.
Fossarus ambiguus L.
Calyptra chinensis L.
Obeliscus dolabratus L.
**Clanculus kraussii* Ph.
**Mytilus afer* Gm.
**Arca lactea* L.
Kellya mactroides Hanley.
Dosinia africana Gray.
Callista floridella Gray.
Venus verrucosa L.
Anaitis declivis Sow.
Tapes pullastra Mont. var. *corrugata* Gm.
Donax rugosus L.
Donax oweni Hanley.
**Gari depressa* Penn.
**Solen marginatus* Penn.
Mactra glabrata L.
Saxicava arctica L.
**Lucina columbella* Lam.
**Loripes lacteus* L.
Tellina madagascariensis Gm.

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[1] Act. Soc. Linn., Bordeaux, lxiv, 47, 1910.
Ann. Inst. Océanogr. v, fasc. 3, p. 1, 1912.

Trochocochlea sagittifera Lam.
Patella natalensis Krs.
Ostrea lacerata Hanley.
Ostrea cucullata Born.
Gastrana guinaica Schr. (= *abildgaardiana* Sp.)
**Macoma cumana* Costa.

Ten of the above (*) may be expunged as erroneously ascribed to S. Africa, and very probably *Clavatula lineata*, *O. dolabratus* and *D. oweni* should go with them. *A. declivis* as S. African rests upon a single example from Durban which differed from the type and sounds, therefore, a doubtful record.

We have, however, among the rest a residuum of characteristic Cape forms, e.g., *P. aperta*, *Nassa pœcilosticta*, *Patella natalensis*, *K. mactroides* and the *Gastrana*, whose range extends to Mossamedes or even further North, no doubt by the agency of the Benguela Current.

Most of the others I regard as W. African littoral species which have worked their way southwards along the coast, e.g., *Mactra glabrata*, *D. rugosus* and *Tapes corrugatus* (I see no reason to lump this with *T. pullastra*). Possibly the *Gastrana* belongs rather to this category.

But, though a few Cape skirmishers reach Mossamedes, its molluscan fauna is eminently W. African: it produces such genera as *Pusionella*, *Pseudoliva*, *Aspa*, *Eglisia* and *Tugonia*, and must be almost the southern continental limit of *Thais haemastoma* L., *Arca senilis* L., *Strigilla splendida* Ant., *Tivela tripla* L. and *Terebra senegalensis* Lam., all of which the late Mr. Shackleford and I received direct from Mossamedes some eight years ago. Further collecting is especially desirable on the northern limits of S.W Africa. In all probability the boundary line of the Cape fauna will prove to be, as I have already suggested, somewhere about the mouth of the Cunene River, which separates British from Portuguese territory.

In concluding, I should like to express my thanks to Mr. R. Winckworth for much enlightenment concerning the ocean currents in the Atlantic and for the map which is reproduced on p. 256.

◆

Paludestrina jenkinsi (Smith) **in Somerset N.**—While staying at Clevedon in October, 1920, I found this mollusc swarming in countless numbers in a small stream which empties itself near the Pill and is for some distance tidal. Swanton in his Mollusca of Somerset says of *P. ventrosa*: "In marvellous abundance in a ditch near the Pill, Clevedon (Norman)." Of this species (living) to-day there appears to be no trace in the district, although Mr. Kennard informs me that he has some specimens labelled "Clevedon" collected many years ago by Canon Norman. It looks as if *jenkinsi* has ousted its relative from the district. It would be interesting to know if this is happening in other districts.—DOUGLAS BACCHUS (*Read before the Society*, March 2nd, 1921).

EDITORIAL NOTES.

We are asked to publish the following letter :—

Nov. 1st, 1921.

The Editor of the *Journal of Conchology*.

"SIR,

There appeared in the last number of the *Journal* a paper by Herr Hans Schlesch on the Land and Fresh-water Mollusca of East Iceland. The author enumerates eight species of Pisidia, all of which he states were collected by him in East Iceland, and it might be inferred from the author's reference to us that we were satisfied that these eight species of Pisidia inhabit Iceland. It is true that the specimens upon which the records are founded have passed through our hands, but the appearance of some of them at any rate did not suggest shells from a northern latitude, and it occurs to us that Herr Schlesch may have sent us shells from some continental locality under the impression that they were really the ones he had collected in East Iceland. We wish to make it clear, therefore, that except as regards *P. casertanum*, which is a well-known Icelandic species, Herr Schlesch is solely responsible for the statement that these Pisidia occur in the localities cited in his paper.

Yours faithfully,

A. W. STELFOX.
R. A. PHILLIPS.
CHAS. OLDHAM."

Pilsbry, in part 101 of the *Manual*, springs a surprise upon English conchologists by describing a new form of Pupillid from the S. of England.

What we have been accustomed to call *Vertigo minutissima*, Hartmann, is transferred to the genus *Truncatellina* Lowe (type species *linearis*, Lowe from Madeira), and the specific name *minutissima* changed to *cylindrica* Fér., Hartmann's species being shelved as indeterminable. *T. cylindrica* has the aperture toothless.

The novelty is described as *T. rivierana brittanica* Pilsbry (we deplore the spelling !), a subspecies of the Mediterranean *rivierana* Benson, and came from Portland, Dorset, mixed with *T. cylindrica* (G. C. Spence). The aperture is tridentate—a short tooth on the parietal wall "so deep within that it is not seen in a direct face view," a strong, but obtuse tooth, on the columella "visible in an oblique view in the aperture," and an immersed, rounded or oblong tubercle in the palate.

It may be well, also, to call attention to two other long described British forms which seem to have escaped the notice of the majority of our collectors :—

Pupa muscorum L. var. *glis* West., Nachrichtsbl., 1893, p. 120 was described from Yorkshire (Ponsonby), as "plica parietali alta elongata et in palato pone marginem exteriorem dentibus duobus granuliformibus validis munita." Pilsbry conjectures its identity with var. *tridentata* Jeffreys described in Ann. and Mag. N.H. (2) xv. 22, 1855. [1]Kennard and Woodward adopt the name for the variety once erroneously identified as *triplicata* Studer.

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[1] cf *J. of C.*, xv, 165-6.

Another obscure variety is *P. anglica* var. *gunhildæ* West., described in Fauna Pal. Reg. Binnenconch., iii, 82, 1887, from Scarborough (Sutton). It is said to have the teeth well developed but without any trace of a connecting callus between the peristome and the big parietal lamella. As the peristome is said to be "sehr schwach gelippt," in this form, we rather suspect it of being merely an immaturity.

Mr. Alfred Bell, in the *Essex Naturalist*, xix, pp. 183-221 and 300-302, has a paper entitled "British Oysters, Past and Present," which really constitutes a comprehensive monograph of the British forms of *Ostrea*. It is illustrated with seven photographic plates, and besides discussing many already named forms, describes and figures the following new ones: *O. edulis* var. *celtica*, var. *estuarii* and var. *tenbiensis*, *O. atlantica*, *O. cantii*, *O. foulnessii*, *O. devonensis*, *O. montagui*, *O. canveyensis*, *O. angulata erthensis* and *O. vertex*. The paper is full of interesting historical and geographical details and merits careful study.

Mr. G. C. Robson has an important paper in the October number of the Annals and Mag. Nat. Hist., pp. 401-413 on the "Anatomy and Affinities of *Hypsobia nosophora*." This mollusc, originally described by Mr. Robson in 1915, is a Japanese Paludestrinid which acts as intermediate host to the Japanese *Schistosoma* and is, therefore, a most important factor in the study of Asiatic Schistosomiasis or Bilharziasis. The author comes to the conclusion that the genus *Hypsobia* probably represents a separate sub-family of the *Paludestrinidæ*: the characters of the alimentary canal, nervous system and genitalia are distinctly of this family, but the specialised respiratory system, the kidney, the female genitalia and the spermatozoa seem to separate it from any of the sub-families hitherto recognised.

We commend the following request to members:—*Helix nemoralis* Linné and *H. hortensis* Müll..—The writer of this note is engaged in the study of the numerical relationships of the main varietal forms of these species in different colonies. He would be grateful for any information regarding the position of areas (preferably within 100 miles of London) where either or both species occur in any numbers. Also he would be particularly glad to hear of any "birdstones" from which he could obtain the débris of broken shells of the same two species.—C. Diver (Captain). 40, Pembroke Square, Kensington, W. 8.

Helix hortensis on Thrush Stones.—In a recent note read before the Society the question was raised as to whether *Helix hortensis* had been found round thrush stones. When at Arbroath in June, 1920, I found this shell in large numbers on stones north of the town, in fact they formed 95 per cent. of the broken shell, the remainder being four per cent. *H. arbustorum* and one per cent. *H. nemoralis*. Mr. R. Standen also informs me he has found *H. hortensis* on thrush stones in Lathkildale, Derbyshire.—A. K. Lawson (*Read before the Society*, April 6th, 1921).

A COLLECTION OF MOLLUSCA FROM THE BELGIAN CONGO.

By G. C. SPENCE.

(Read before the Society, 9th June, 1920).

THROUGH the courtesy of Mr. J. W. Jackson the above Collection, made during 1918 and 1919 by our member, Mr. F. M. Dyke, has been entrusted to me for investigation. The number of specimens is not large, but they are mainly in fine condition. It soon became apparent that there was a number of novelties and these were being worked up when, most opportunely, Dr. Pilsbry's work on Congo Mollusca[1] was issued. It was then found that all these novelties were therein described and figured. Mr. Dyke has made full and careful notes, and the particulars given hereafter are from information kindly supplied by him.

Collections were made at the following places :—

(1) Leverville, District du Kwango, at the junction of rivers Kwenge and Kwilu. Approximate situation, 5°10'S ; 18°40'E.

(2) Tango, Dt. du Kwango, on right bank of Kwilu some 40 km. north of Leverville. 4°40'S ; 18°35'E.

(3) Boteke, Dt. de l'Equateur, a small native village on R. Ruki. 0°12'S ; 18°55'E.

(4) Elizabetha, Dt. d'Aruwimi, on R. Congo opposite Basoko. 1°12' N ; 23°40' E.

(5) Iboro Island, a long narrow island (some 20 × 1/1½ km.) about 15/20 km. above Elizabetha and opposite Yalemba on right bank of Congo. About 1°8' N ; 23°55' E.

(6) Alberta, nr. Bumba, Dt. de Bangalas. Bumba's position 2°10'N ; 22°30' E.

Boteke "was the best by far for collecting . . . the position is of some interest ; near the Equator, there is an equable temperature and well distributed rainfall throughout the year."

"I have been very struck with the paucity of molluscs in palm forests and have wondered whether the dryness of the soil had anything to do with this. The palm is essentially a surface feeder and one rarely finds real forest trees in quantity growing with the palms. At all events, the shells taken in palm growing districts were usually found under leaves, &c., in patches of undergrowth away from the immediate neighbourhood of the palms (*Elæis guineensis*). I *have* found one or two dead shells round the roots of palms in the course of three years' experience."

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[1] "A Review of the Land Molluscs of the Belgian Congo, chiefly based on the collection, the Amer. Mus. Congo Expedition, 1909/15," in Bull. A.M.N.H., vol. xl, 1919.

In this connection it will be remembered that certain habitats in Britain are not favoured by molluscs, e.g., heather and bracken—also pine woods in which the ground is often bare and covered with fallen needles.

The following species were collected along with a few more which owing to condition or juvenility it is impossible to identify:

LEVERVILLE.

Limicolaria læta Thiele, sub. sp. **medjensis,** Pils. "On sandy grass plain." Epiphragm pearly with knife-like slit in upper angle.

Limicolaria distincta Putzeys. "In considerable numbers after rain, crawling on sandy paths and in elephant grass."

Subulina thysvillensis Pils. "Amongst soil in leaf bases or oil palms."

Aetheria elliptica Lam. "The common fresh water edible 'oyster,' occurring in beds, especially on the northern bend of R. Congo from Lisala to Basoko. In many parts the shells are collected and burnt for lime for building purposes." Several fine examples (from R. Kwilu) with well developed tubular spines, showing the aptness of Sowerby's name *tubifera* applied to this species, but now relegated to synonymy.

TANGO.

Limicolaria distincta Putzeys. In grass by road side.

BOTEKE.

Homorus (Subulona) ischnus Pils.

Subulina angustior (Dohrn).

Pseudoglessula (Kempioconcha) leopoldvillensis Pils.

Pseudoglessula (Ischnoglessula) subfuscidula Pils. A beautiful dark little species with whitish columella margin.

Curvella ovata Putzeys.

Ptychotrema (Parennea) æquatoriale Pils. Under dead wood in damp undergrowth.

Gulella lævigata (Dohrn).

Mesafricarion (Belonarion) putzeysi Pils. One fragmentary example which I cannot definitely determine but which agrees with description—especially as to colour and the white, glittering first whorl.

All except *P. æquatoriale* "in moist damp wood in high forest."

ELIZABETHA.

Achatina schweinfurthi Mts. By native paths.

Ceras manyemaense Dup. and Putz. In grass by native path. One, in fine condition, of this rare shell agreeing with the author's description in all except colour, which (light brown with dark streaks) resembles *C. dautzenbergi* D. & P.

Pseudoglessula (Kempioconcha) hessei (Bttg.)
Thapsia rufescens Pils.
Ledoulxia mozambicensis (Pfr.)
In grass beside bush path.

Mesafricarion haliotides (Putzeys). Amongst grass. One spirit specimen which I submitted to Dr. W. E. Collinge, who kindly confirms my identification.

Pleuroprocta silvatica Pils. Amongst grass. Two spirit specimens—not full grown.

IBORO ISLAND.

Perideriopsis mvuluensis D. & P. On leaves of shrubs. One slightly immature example. Not typical, colour being creamy with narrow ill-defined dark band below suture.

Ledoulxia mozambicensis (Pfr,) On leaves of shrub—sp. unknown.

ALBERTA.

Limicolaria walkeri mut. **nudata** Pils. Swarming on *Iris* sp. in gardens. No striped typical ones.

At BARUMBA, Aruwimi Dist., one dark juvenile **Burtoa nilotica** (Pfr.) was found "in broken wood at foot of tree in bush."

◆

H. hortensis var. arenicola, near Sittingbourne.—For the past two years there has been a large colony of this variety on a wall near Sittingbourne; with one exception, every specimen I have seen has been of the band formula (12345), which is otherwise very rare in the neighbourhood. I have never seen a specimen of the typical colouration in this colony, the only specimen with a different band formula was one (12) (345). The wall is a red brick one, on the edge of a pavement, the only vegetation on it being ivy and a few lichens. It is also the only locality near Sittingbourne for the scarce red variety of the moth *Bryophila perla*.—H. C. HUGGINS (*Read before the Society*, Nov. 10th, 1920).

LIMAX TENELLUS Müll. IN WALES.

By HUGH WATSON, M.A.

(Read before the Society, November 10th, 1920).

THIS species does not seem to have been hitherto recorded from Wales, and it may therefore be of interest to mention that it occurs at Llangammarch Wells in Brecknockshire, where I found it in July, 1920. It was present in more than one spot, amongst trees of various kinds, on the south side of the River Irfon, between one and two miles east of the village of Llangammarch. The geological formation is that of the Wenlock Flags and Shales, belonging to the Silurian System, and the locality is by no means a good one for snails. Slugs, however, are common, and the following species were all found within a short distance of the places where *Limax tenellus* occurred :—*Arion ater* (Linné), *A. subfuscus* (Drap.), *A. hortensis* Fér., *A. circumscriptus* Johnston, *A. intermedius* Normand, *Agriolimax agrestis* (Linné), and *Limax arborum* B.-Ch. The last species occurred under stones on the slopes of the Mynydd Eppynt, at 1,000 ft. above sea-level, as well as in association with *L. tenellus.* In view of the fact that colour alone cannot always be relied upon in the identification of slugs, it may be worth pointing out that *Limax tenellus* is characterised not only by its usual yellow colour, faintly banded mantle, and dark tentacles, but also by the hinder edge of the mantle being broadly rounded, the medium angle, such as we find in *L. arborum*, etc., being reduced to a minimum. The radula of *L. tenellus* is also easily distinguishable from that of any other slug known to inhabit the British Isles.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

499th Meeting, held at the Manchester Museum, February 2nd, 1921.
Mr. R. Standen in the chair.

Donation to Library.

"Manual of Conchology," part 101, by H. A. Pilsbry (*from the author*).

New Members Elected.

Miss J. D. Robertson. Leslie S. V. Watson.

Resignation.

J. Kidson Taylor.

Members Deceased.

Wm. Whitwell. H. H. Corbett. G. B. Sowerby.

Papers Read.

" *Pomatias elegans* (Müll.) at Llandudno," by A. K. Lawson.

" Pearl in *Littorina littorea* L.," by Dr. W. T. Elliott.

Principal Exhibits.

By Mr. A. K. Lawson : *Pomatias elegans*, from Llandudno ; *L. truncatula* and *L. pereger* var., from Tent's Muir, Fife ; *L. pereger* var. *lacustris*? from R. Tay, Perth ; *A. fluviatilis*, from Millbrook, Perth.

By Dr. W. T. Elliott : *L. littorea* and pearl from same.

The Special Exhibit was *Rostellaria.*

500th Meeting, held at the Manchester Museum, March 2nd, 1921.

Mr. R. Standen in the chair.

Papers Read.

" *Paludestrina jenkinsi* in Somerset N.," by D. Bacchus.

" A peculiar form of *Hygromia fusca* from Leigh Woods, Somerset," by D. Bacchus.

" Obituary Notice : George Brettingham Sowerby," by H. C. Fulton.

Principal Exhibits.

By Mr. C. Oldham : *H. draparnaldi* from Berkhamsted ; *A. cygnea* (very pale form) from Weston Turville Reservoir, Bucks. On behalf of Dr. F. F. Laidlaw : *P. cylindracea*, *V. pygmæa*, and *V. moulinsiana* found in association on rushes, on banks of the Itchen, Eastleigh, Hants. (S.) ; *V. substriata* from Hill Moor, Culmstock, Devon (S.) ; *V. pygmæa* (var. with seven teeth), from Uffculme, Devon (S.).

By Mr. A. K. Lawson : *H. hortensis* and *H. arbustorum* from "Thrush-Stones," Arbroath.

The Special Exhibit was *Planispira.*

501st Meeting, held at the Manchester Museum, April 6th, 1921.

Mr. R. Standen in the chair.

Donations to the Library.

" Das Quotientengesetz ; eine biologisch-statistische Untersuchung," by Chr. Petersen *(from the author).*

" Summary of the Marine Shellbearing Mollusks of the North-west Coast of America, from San Diego, California, to the Polar Sea, mostly contained in the Collection of the United States National Museum, with Illustrations of hitherto unfigured Species," by W. H. Dall *(from the author).*

Member Deceased.

John Ray Hardy.

Papers Read.

" Notes on the Land and Freshwater Mollusca of East Iceland," by H. Schlesch.

" *Helix hortensis* on Thrush Stones," by A. K. Lawson.

" *Cryptodon eutornus* sp. nov.," by J. R. le B. Tomlin, M.A.

" Note on *Mactra complanata* of Reeve and Deshayes," by J. R. le B. Tomlin, M.A.

"Note on *Trochus pennanti* Philippi," by J. R. le B. Tomlin, M.A.

"Note on the *Stomatella bicarinata*, *S. biporcata*, and *S. margaritana* of A. Adams," by J. R. le B. Tomlin, M.A.

Principal Exhibits.

By Mr. E. Crapper: *Pecten tigrinus* (young valves) from the stomach of a flounder; various shells from Perth, including *Paludestrina jenkinsi* from Kinfaims.

The Special Exhibit was *Harpa.*

502nd Meeting, held at the Manchester Museum, May 4th, 1921.

Mr. R. Standen in the chair.

Candidate Proposed for Membership.

James Gibson, 66, Ramsey Street, Scarborough (introduced by J. A. Hargreaves and J. W. Jackson, M.Sc.).

Papers Read.

"On some Species of *Pisidium* in the Swedish State Museum," by Nils Hj. Odhner.

"Description of a New South African *Ancilla*," by J. R. le B. Tomlin, M.A.

There were numerous exhibits by Messrs. R. Standen, A. T. Hopwood, G. C. Spence, A. K. Lawson, R. Harrison, and Mrs. Gill.

503rd Meeting, held at the Manchester Museum, September 7th, 1921.

Mr. R. Standen in the chair.

New Member Elected.

James Gibson.

Candidate Proposed for Membership.

A. W. Wincott, 3, Gwydr Gardens, Swansea (introduced by J. W. Jackson and R. Standen).

Resignation.

Y. Hirase.

Member Deceased.

G. O. Howell.

Members Struck off the List (Rule iv).

H. S. Wallace. H. Brooksbank. W. H. Ingrams.

Papers Read.

"*Physa heterostropha* in Middlesex,—a correction," by J. E. Cooper.

"*Valvata macrostoma* in Cambridgeshire," by C. Oldham.

"*Paludestrina confusa* in the Waveney Valley," by C. Oldham.

"Four New Species of Marine Shells from S. Africa," by J. R. le B. Tomlin, M.A.

There were exhibits by Messrs. C. Oldham (to illustrate his papers), A. K. Lawson, J. W. Jackson and R. Standen.

504th (Annual) Meeting, held at the Medical School, University College, London, W.C., October 15th, 1921.

The President, Mr. J. R. le B. Tomlin, in the chair

Amongst those present were the following:—Messrs. J. Wilfrid Jackson, J. C. Dacie, A. J. Saban, A. S. Kennard, C. Oldham, P. E. Radley, L. E. Adams, F. B. Jennings, H. W. Worsfold, H. E. J. Biggs, B. B. Woodward, J. E. Cooper, H. L. Gauntlett, J. H. D. Saunders, Drs. A. E. Boycott, E.W. Bowell, C. Price-Jones, Colonel A. J. Peile, Captain C. Diver, and Miss Phyllis Cooke.

Appointment of Auditors.

Messrs. C. H. Moore and A. K. Lawson were appointed Auditors.

Appointment of Scrutineers.

Messrs. A. J. Saban and H. W. Worsfold were appointed Scrutineers.

New Member Elected.

A. W. Wincott.

Candidates Proposed for Membership.

Rev. Laurence William Grensted, M.A., B.D., Egerton Hall, Victoria Park, Manchester (introduced by J. W. Jackson and R. Standen).

Prof. T. D. A. Cockerell, Professor of Zoology, University of Colorado, 908, 10th Street, Boulder, Colorado U.S.A. (introduced by J. R. le B. Tomlin and A. S. Kennard).

Lieut.-Col. A. J. Peile, R.A., 18, Leopold Road, Wimbledon, S.W. 19 (introduced by J. R. le B. Tomlin and J. C. Dacie).

Dr. Cecil Price-Jones, The Medical School, University College Hospital, University Street, London, W.C. 1.

J. H. D. Saunders, 14, Warwick Avenue, Paddington, W. 2.

Dr. E. W. Bowell, 21, Princess Road, South Norwood, S.E. 25.

(All three introduced by Dr. A. E. Boycott and J. W. Jackson).

Presidential Address.

Mr. J. R. le B. Tomlin gave his address:—"Some Remarks on the Cape Marine Province."

A cordial vote of thanks was passed to the retiring President for his services.

Votes of thanks were also accorded to the authorities of the University College Medical School (per Dr. A. E. Boycott) for permission to hold the Annual Meeting in their rooms; and to the authorities of the Manchester Museum for continued permission to hold the monthly meetings on their premises.

Election of Officers and Council.

The Scrutineers reported that the Officers and Council for 1921-22 as nominated by the Council had been unanimously elected (*see page 245*).

Exhibits.

By Mr A. J. Saban:—*Helix lapicida* from Farnboro', Kent.

By Dr. E. W. Bowell:—Series of stained radulæ of British snails; also numerous illustrations of same. Dr. Bowell also gave a lantern demonstration on radulæ, which was much appreciated.

By Dr. A. E. Boycott:—Breeding experiments with sinistral *Limnæa peregra* with results to date: *Clausilia biplicata*, dextral, from Cambridge, July, 1920.

By Capt. C. Diver:—Mating and breeding experiments with *Helix nemoralis* and *H. hortensis*.

By Mr. B. B. Woodward :—*Dreissensia polymorpha* attached to *Anodonta* and *Unio*, obtained by Mr. A. H. Bishop (Brit. Mus. Nat. Hist.), from a Metropolitan Water Board reservoir at Barnes, Surrey, Sept., 1921.

By Mr. H. W. Worsfold :—Barton Clay and recent *Epitonium* ; *Helix aspersa* from Worthing.

By Mr. A. S. Kennard :—Jeffreys' own copy of his "Synopsis of the Testaceous Pneumonobranchous Mollusca of Great Britain" ; Hanley's copy of "A History of British Mollusca and their Shells."

By Mr. J. E. Cooper :—Species of *Polygyra*, *Pleurodonte*, and *Odontostomus*, showing remarkable apertures.

By Mr. J. C. Dacie :—*Nucella lapillus*, from Seaford, showing 2, 3, and 4 internal tubercles ; also foreign *Thais*, *Sistrum*, and *Monoceros*, showing the same peculiarity.

By Mr. J. W. Jackson :—Varieties of *Pupilla muscorum* from various localities ; *Truncatellina cylindrica* (=*minutissima*), and *T. rivierana brittanica* Pils. from Portland.

By Mr. W. H. Heathcote :—*Clausilia bidentata* var. *septentrionalis*, and *Paludestrina jenkinsi* var., from Longton Marsh, Lancashire.

By Mr. A. W. Stelfox :—Locality sets of *Planorbis vortex* and *P.* "*spirorbis.*"

By Mr. J. R. le B. Tomlin :—Series of some British *Pectinidæ*, including *striatus* Müller, and white variety, *incomparabilis* Risso, *septemradiatus* Müller, with var. *dumasii* Payr., and white var. ; about twenty species of *Cæcilioides* ; *Truncatellina cylindrica* Fér. (*minutissima* auctt.) from Swanage, and *T. brittanica* Pilsbry from Portland ; a practically complete set of palæarctic *Pomatiidæ*, including *P. mauretanicum* Ply., *Leonia jolyi* Ply., and var. *boiteli* Ply., and *L. scrobiculatum* Mss.

ANNUAL REPORT.

THE present is the Forty-Fifth Annual Report of the Society. During the last twelve months we have lost five members by death, five by resignation, and seven struck off the roll under Rule 4, making a total loss of seventeen. The new members amount to four only (including one elected at this meeting). The membership of the Society now stands at 277 (comprising 10 Honorary and 267 Ordinary Members), as against 290 at the last Annual Meeting.

The members lost by death are W. Whitwell ; G. O. Howell ; H. H. Corbett (obituary in "The Naturalist," April, 1921) ; J. Ray Hardy (obituary in "The Lancashire and Cheshire Naturalist," May, 1921) ; and G. B. Sowerby (obituary in this *Journal*, Sept., 1921).

The usual monthly meetings have been held at the Manchester Museum (by kind permission of the authorities) and have been well attended. About thirty notes and papers have been read, some of which have been published already in the *Journal*. In addition to numerous smaller exhibits, the following Special Exhibits have been held :—Slugs and their Shells ; *Cochlitoma* ; *Rostellaria* ; *Planispira* ; and *Harpa*.

During the year three numbers of the *Journal* have been published ; vol. 16, no. 5, January, 1921 ; and no. 7, September, 1921, being ordinary numbers, comprising some sixty-four pages of text, one plate, and eight text-figures ; no. 6, June, 1921, being a Special "Roebuck Memorial Number," consisting of a "Census of the Distribution of British Land and Freshwater Mollusca," by the late W. Denison Roebuck. The Society is much indebted to Dr. and Mrs. A. E.

Boycott for arranging the vast amount of material and seeing it through the press; also to Dr. Boycott and Dr. E. J. Salisbury for the preparation of the five plates of distribution maps which accompany the work.

The Library has received several additions, principally from Drs. H. A. Pilsbry, W. H. Dall, P. Bartsch, A. E. Boycott, W. G. N. van der Sleen, Prof. P. Pelseneer, Messrs. Ch. Petersen, C. de la Torre, J. B. Henderson, A. S. Kennard, B. B. Woodward, J. R. le B. Tomlin, W. B. Marshall, W. E. Alkins, H. Watson, and A. T. Hopwood.

The donations to the Cabinet have been few, mainly from Messrs. C. Oldham, J. E. Cooper, F. Taylor, and B. Sundler.

RECORDER'S REPORT.

The following new records have been authenticated since the publication of the Census :—

Channel Isles :—*Ovatella bidentata*, *Paludestrina jenkinsi* (J. R. le B. Tomlin).

Scilly Isles :—*Hyalinia lucida*, *Helix aspersa* (H. E. J. Biggs).

Devon South :—*Vertigo substriata* (Culmstock, F. F. Laidlaw).

Somerset South :—*Acme lineata* (Bossington), *Vallonia excentrica*, *Paludestrina ventrosa*, *Pal. stagnalis*, *Ovatella bidentata*, *Phytia myosotis* (N. G. Hadden).

Dorset :—*Pisidium casertanum*.

Isle of Wight :—*Paludestrina jenkinsi*, *Limnæa truncatula*, *Planorbis contortus* (C. Oldham).

Kent West :—*Vallonia pulchella* seg., *Vall. excentrica* (A. E. Boycott).

Essex North :—*Pisidium casertanum*.

Herts. :—*Hyalinia lucida* (garden, C. Oldham).

Berks. :—*Paludestrina jenkinsi* (A. Gardiner).

Bucks. :—*Physa heterostropha* (Aylesbury, A. E. Salisbury).

Suffolk East :—*Paludestrina confusa* (Waveney at Barsham, C. Oldham), *Pisidium hibernicum*.

Norfolk East :—*Paludestrina ienkinsi* (C. Oldham), *Pisidium henslowanum*, *Pis. hibernicum*.

Cambridge :—*Valvata macrostoma* (fen drains at Ely, C. Oldham), *Pisidium pulchellum*.

Worcester :—*Clausilia rolphii*, *Pupa anglica*, *Ashfordia granulata* (all in Shrawley Wood, W. T. Elliott and J. H. Adams).

Stafford :—*Vallonia excentrica* (W. E. Alkins).

Glamorgan :—*Planorbis glaber* (Kenfig Pool, Porthcawl; probably holocene, H. E. Quick).

Merioneth :—*Limax flavus*, *Planorbis albus*, *Paludestrina stagnalis*, *Vertigo alpestris* (Dolgelly), *Pisidium lilljeborgi* (C. Oldham).

Carnarvon :—*Paludestrina stagnalis*, *Pal. jenkinsi* var. *aculeata*, *Valvata piscinalis* (C. Oldham).

Denbigh :—*Paludestrina jenkinsi*, *Pal. stagnalis*, *Bithinia tentaculata*, *Valvata piscinalis*, *Planorbis carinatus*, *Helicella heripensis* (C. Oldham), *Pisidium pulchellum*, *Pis. henslowanum*, *Pis. nitidum*.

Flint :—*Paludestrina stagnalis*, *Pal. jenkinsi* (C. Oldham), *Pisidium nitidum*.

Lincoln North :—*Pisidium casertanum*.

Cheshire :—*Helicella caperata* seg. (J. R. le B. Tomlin).

Lancashire South :—*Phytia myosotis* (W. H. Heathcote); *Helicella caperata* seg. (L. W. Grensted).

Yorkshire N.E. :—*Pisidium supinum*.

Yorkshire S.W. :—*Pseudanodonta* sp. (Wakefield and Barnsley Canal, Agbrigg, J. D. Firth).

Edinburgh :—*Limnæa stagnalis* (Duddingston Loch, ? native, E. Crapper).

Perth East :—*Paludestrina ienkinsi* (brackish and fresh water, E. Crapper and H. Coates).

The records for *Clausilia cravenensis* in Northants (Weekly Hall Wood, Kettering, 1897) and for *Theba cantiana* in Channel Isles (Jersey, about 1850), are very doubtful and should be suspended until confirmed. Records for *Physa acuta* require re-examination, and it is desirable that fresh specimens should be submitted for authentication *with the animal.*

Authenticated records of the occurence of *Azeca tridens* in Perth South were overlooked in compiling the census; the species should be added to the list for v.c. 87 and the statement on p. 174 amended.

ANNUAL REPORT OF THE LEEDS BRANCH.

NINE meetings have been held during the year. The three summer rambles were most unproductive owing to the arid conditions. The six winter meetings, as in the past, were well attended, and the exhibits many and varied. A paper was given by Mr. J. F. Musham on the breeding of *Limnæa glabra* in confinement. The Secretary gave a report on the oecological investigations carried out in a prescribed length of the Leeds and Liverpool Canal between Calverley and Rodley.

Three special exhibits were displayed, viz., Limnæidæ, British marine univalves, and British marine bivalves.

Mr. A. Thornes is our President. F. BOOTH, *Hon. Sec.*

ANNUAL REPORT OF THE LONDON BRANCH.

ELEVEN evening meetings and one in the field were held during the year. The meetings were fairly well attended, and the exhibits of both British and foreign species were good. The President, Mr. A. S. Kennard, continued his Notes on British Land and Freshwater Species, and also exhibited and explained several works on mollusca by the early British conchologists. At the meeting in June Capt. Cyril Diver read a most interesting paper on the "Mating and Breeding of *Helix nemoralis* and *H. hortensis*," giving his observations on the methods of courtship and coition. J. C. DACIE, *Hon. Sec.*

ANNUAL REPORT OF THE NORTH STAFFORDSHIRE BRANCH.

ALTHOUGH it has not been possible to convene official meetings and excursions during the past year, members have worked individually or in pairs, and the following records are worth noting:—*Sphærium pallidum*: taken in the Froghall Canal, near Cheadle, by Messrs. J. and W. Hill, after being apparently absent for many years. *Testacella haliotidea*:—two taken near Longton, where this species is permanently established (B. Bryan). An addition to our knowledge of the mollusca of the district is the paper by Mr. W. E. Alkins on "Some Recent Records of Mollusca in the Churnet Valley and North-East Staffordshire," read before the North Staffordshire Field Club and printed in the Club's Current Trans- [illegible] pp. 88—105. This paper contains a special study by the writer, with the assistance of Mr. A. W. Stelfox, of the *Pisidia* of the district; also records of the rare *Zonitoides nitidus* var. *viridescens*.

B. BRYAN, *Hon. Sec.*

505th Meeting, held at the Manchester Museum, November 2nd, 1921.

Mr. G. C. Spence in the chair.

New Members Elected.

Rev. L. W. Grensted. Dr. Cecil Price-Jones. J. H. D. Saunders. Dr. E. W. Bowell. Prof. T. D. A. Cockerell. Lt.-Col. A. J. Peile, R.A.

Papers Read.

"A Visit to Loch Skene in Search of *Limnæa burnetti*," by E. Crapper.

"*Physa fontinalis* new to Selkirkshire," by E. Crapper.

"*Paludestrina jenkinsi* in Scotland," by E. Crapper.

"*Limnæa stagnalis* in Edinburgh," by E. Crapper.

"Note on *Trochus pennanti* Philippi," by Lt.-Col. A. J. Peile, R.A.

"A Colony of *Limax flavus* var. *tigrina* Pini at Reigate," by L. F. Adams, B.A.

Principal Exhibits.

By Mr. C. Oldham:—*Helix caperata* var. *obsoleta*, Rhos-on-Sea, North Wales; *H. striolata* var. *alba*, Dolgelly; *Pupa anglica*, Pentir, Carnarvonshire (*all presented to the cabinet*).

By Mr. L. E. Adams:—*Limax flavus* var. *tigrina* from Reigate, to illustrate his note (*presented to the cabinet*).

By Mr. E. Crapper:—*P. jenkinsi* from Kinfauns and Longforgan, Perthshire East; *L. stagnalis* and *L. pereger* from Duddingston Loch, Edinburgh; *L. truncatula*, Perth; *H. nemoralis*, Lucky Scaup, Fife; *Physa fontinalis*, *L. pereger* and *A. fluviatilis* from St. Mary's Loch, Selkirkshire (*all presented to the cabinet*).

The Special Exhibit was *Xenophora*.

506th Meeting, held at the Manchester Museum, December 7th, 1921.

Mr. G. C. Spence in the chair.

Member Deceased.

The Rev. Canon J. W. Horsley, M.A.

A vote of condolence with the relatives was passed unanimously.

Papers Read.

"On *Alopia cyclostoma* (Bielz), *A. canescens* (Charp.), and *A. deaniana* n.sp.," by the Rev. Dr. A. H. Cooke, F.Z.S.

"*Pisidium lilljeborgii* in Merionethshire and Denbighshire," by C. Oldham, F.L.S.

Principal Exhibits.

By Mr. W. H. Davies: *Physa heterostropha* from the Bridgewater Canal at Trafford Park, Manchester.

By the Rev. L. W. Grensted: *Hygromia striolata* var. *albocincta-depressa* from Oban, Aug., 1921, and var. *alba* from Cumnor Road, near Oxford; *Dreissensia polymorpha* (one odd and two paired valves) from drift-wood on Blundellsands shore, Lancs.; *Helix* (*Macularia*) *lactea* picked up on Blundellsands shore, probably from a Spanish fruit ship wrecked there; *Leptinaria striosa* (C. B. Adams) from "pockets" on sandhills, Hall Road, near Liverpool; probably blown up from shore and derived possibly from some West Indian ship.

The Special Exhibit was *Pupinella*.

LIMAX TENELLUS IN GLOUCESTER WEST, HEREFORD AND MONTGOMERY.

By C. OLDHAM.

(Read before the Society, December 8th, 1920).

The occurrence of this slug in places so far apart as the Forest of Rothiemurchus, the New Forest, and Kent suggests that it is generally distributed in Britain—it has not been observed in Ireland—although we know very little of its precise range. So far as my own experience goes it is, like *L. cinereo-niger*, restricted to natural woodlands, and it is useless to look for it in cultivated country or in plantations ; but given primæval woodland it accommodates itself to varied circumstances, and I have taken it on fungi in beech, fir, oak and birch forest indifferently. Ignorance of mycology debars me from naming all the different ground fungi on which it feeds, but speaking broadly it prefers the more succulent kinds, such as *Russula* and *Boletus*, including *B. edulis*. I have taken it in tufts of *Hypholoma fasciculare*, and, like *Arion subfuscus* and *A. intermedius*, it is not deterred by the, to us, repulsive odour of *Phallus impudicus*. It feeds chiefly at night, secreting itself during the day among dead leaves or in a mouse-run or some other convenient cranny underground where its detection is difficult, but during wet weather it feeds at all hours, and search on warm rainy days between September and February offers the best chance of success. In October, 1920, I took *L. tenellus* in three counties for which there were no previous records. It occurred in woods of oak, hazel. and beech, a mile to the south of Symonds Yat, (Gloucester West), associated with *L. cinereo-niger* and *A. ater*. There was a scarcity of ground fungi here and the specimens I took were all feeding on *Hydnum repandum*, a species that is neglected in the beechwoods on the Chilterns if certain others are available. In Haugh Wood near Woolhope (Hereford), a large stretch of oak-hazel coppice, I found *tenellus* feeding on several different ground fungi, associated with *A. ater*, *A. intermedius*, and *A. circumscriptus*. Some three miles N.W. of Welshpool (Montgomery) it was found on fungi in an oak-hazel wood with a sprinkling of planted beeches, associated with *A. ater*, *A. subfuscus*, and *A. intermedius*. In all three localities the specimens taken were referable to the var. *cerea*, the common form in this country.

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NOTES ON THE NOMENCLATURE OF HYGROMIA, HELICELLA, Etc.

BY HUGH WATSON, M.A.

(Read before the Society, February 1st, 1922).

IN October, 1921, Messrs. Gude and Woodward published an article "On *Helicella*, Férussac,"[1] in which they advocate a number of drastic changes in the names of familiar genera and subgenera of snails. While deploring the necessity for making these changes, they appear to think that they must be adopted if the International Rules of Nomenclature are to be strictly followed. Two months later, however, the same authors stated that three of the changes which they had proposed were incorrect, and they amended them accordingly.[2]

The following brief notes are intended to show that even after these emendations have been made most of the suggested changes in the names of those groups which occur in England are not in accordance with the current Rules and Recommendations of the International Code, and therefore, in the present state of our knowledge, they ought not to be adopted by any one who holds the view that changes of names should not be made unless they are required by the International Rules.

Hygromia Risso.

This name, which was first published in 1826,[3] is discarded by Gude and Woodward in favour of *Fruticicola* Held, 1837, because they say that it had "been already employed by Schrank in 1803 for Vermes, and is consequently not available." But Schrank named his tape-worm *Hygroma* not *Hygromia*; and under Article 36 of the International Rules, while we are recommended "to avoid the introduction of new generic names which differ from generic names already in use only in termination or in a slight variation in spelling which might lead to confusion," it is definitely stated that "when once introduced, such names are not to be rejected on this account. Examples: *Picus*, *Pica*;" etc. This is confirmed by Opinion 25, which shows that two names differing from each other only in the presence or absence of an *i* are both valid. It is clear, therefore, that *Hygromia* Risso must not be rejected because of the earlier *Hygroma* Schrank, if the Rules and Recommendations of the International Code are to be observed. Dr. Pilsbry's use of the name *Hygromia* consequently seems to be perfectly correct, and this name should continue to be given to the genus, subgenus, and section, which have as their common type *H. cinctella* (Drap).

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[1] Proc. Malac. Soc., vol. xiv, p. 174.

[2] An. Mag. Nat Hist , 9th ser., vol. viii, p. 624.

[3] For the sake of brevity detailed references already given by Gude and Woodward will not usually be repeated in this paper.

Trichia Hartmann.

Messrs. Gude and Woodward agree that this name was published in 1840, prior to *Trichia* de Haan, 1841; but they reject it in favour of *Capillifera* Honigmann, 1906, apparently because of the earlier names *Trichius* Fabricius, 1775, and *Trichia* Haller, 1768. But the Recommendation of Article 36, quoted above, shows that the name *Trichia* Hartmann must not be rejected because of the earlier *Trichius* of Fabricius, which differs from it in termination—the case is similar to that of *Picus* and *Pica*, the first example given under the Article.[1] And Article 1 likewise seems to prohibit the rejection of Hartmann's name on account of the earlier *Trichia* of Haller; for the lowly organism to which Haller gave this name was placed by him among the plants, and although many biologists now include the group to which it belongs in the animal kingdom, the Rule states that if an organism be transferred from the vegetable to the animal kingdom its name retains its "original botanical status." It is therefore evident that no valid reason has been given for the rejection of the name *Trichia* Hartmann for the section of which *H. hispida* is the type, and it has sixty-six years' priority over *Capillifera* Honigmann.

In their paper of October, 1921, Gude and Woodward also apply the name *Capillifera* Honigmann—instead of *Trichia* Hartmann—to the subgenus to which this section belongs; but in their later paper they maintain that the subgenus should be named *Perforatella* Schlüter (1838). This also is a mistake. It is now agreed that the type of *Perforatella* Schlüter is *H. bidens* Chemn., and Schmidt[2] and others have shown that in this species the reproductive organs are without the paired dart-sacs and accessory sacs which characterise the subgenus *Trichia*, but that these organs resemble those found in the subgenus which Gude and Woodward named *Monachella* in October and *Monachoïdes* in December, a group with which Hesse[3] accordingly associates Schlüter's subgenus. Thus from the anatomy of *H. bidens* Chem. it is certain that *Perforatella* Schlüter should not be regarded as a section of the subgenus of which *H. hispida* is the type—it is a distinct subgenus; therefore the name *Perforatella* must clearly not be used in the place of *Trichia* Hartmann.

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[1] This example shows that the International Commission were rightly following Classical usage in deciding that generic names differing in this manner should not be regarded as homonyms; for although *Picus* and *Pica* are almost certainly merely the masculine and feminine derivatives of the same root, they were regarded as distinct substantives and applied to different kinds of birds by Classical authors.

[2] Abhandl. Naturwiss. Vereines f. Sachsen u. Thüringen, vol. 1, 1855, pl. v, fig. 28.

[3] Archiv f. Molluskenkunde, 1921, p. 66.

Helicella Férussac.

Messrs. Gude and Woodward maintain that Pilsbry and others are wrong in applying the name *Helicella* Fér. (1821) to the well-known Helicid genus which Held called *Xerophila* in 1837, and they state that Férussac's name must be applied instead to the equally well-known Zonitid genus of which the type species is *H. cellaria* Müll. It is evident that this transference of the name *Helicella* from one genus to another will cause endless confusion, but Gude and Woodward seek to justify the proposed change on the grounds, apparently, that in 1847 Gray "fixed" *H. cellaria* Müll. as the type of *Helicella* Fér., and that, in any case, "it is quite obvious" that the name *Helicella* Fér., "can only be applied" to certain members of the second of the four groups into which Férussac divided his subgenus and which he named "Les Aplostomes," because they say that he indicated that this group "contained his typical Helicellas." Yet they give no justification whatever for this last statement beyond the fact that Férussac regarded this second section of his subgenus as the most nearly equivalent to the group which he apparently believed had been named *Helicella* by Lamarck.

In May, 1847, about six months before Gray's paper was published or even read, Herrmannsen[1] designated *H. ericetorum* Müll. (= *H. itala* Lin.) as the type of *Helicella* as restricted by Hartmann in his "Erd- u. Süssw.-Gasteropoden der Schweiz" (1840–44). In this work Hartmann states with truth (on p. 143) that Férussac's subgenus *Helicella* comprised a heterogeneous mass of species, and he therefore restricts the name to the group containing *H. cespitum*, *striata*, *costulata*, *apicina*, *ericetorum*, *obvia*, etc.; de Charpentier[2] had already in 1837 excluded from *Helicella* the species now placed in the Zonitidæ and Endodontidæ. Gray,[3] on the other hand, merely gives *H. cellaria* as the type of Férussac's "*Helicella* (*hyalina*)"—the equivalent of *Helicella* Beck—in the same way as a few lines lower down he gives *H. algira* as the type of Férussac's "*Helicella* (*verticelli*)," another of the groups into which the French author divided his "Aplostomes." But in any case Herrmannsen's designation has priority over Gray's.

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[1] "Indicis Generum Malacozoorum Primordia," vol 1, p. 507. Doubts have been expressed as to the validity of Herrmannsen's designations of type species, as it has been said that he did not profess to select types. But these doubts are not supported by a careful study of Herrmannsen's Latin Introduction to his work, which seems to contain nothing to imply that when he states in his book that certain species are the types of certain genera he does not mean what he says. And even if there were good evidence that Herrmannsen did not himself select the types that he gives, but merely published the selections that had been made by others, this would not effect the validity of his designations. The suggestion that *H. ericetorum* was not the only species which Herrmannsen, in his Index, designated as the type of *Helicella*, is also incorrect.

[2] Neue Denkschr. d. Allg. Schweiz. Gesells. f. d. ges. Naturwiss., vol. 1.

[3] Proc. Zool. Soc., 1847, p. 174.

It is true that the type given by Herrmannsen—*H. ericetorum* Müll.—is placed by Férussac among his "Heliomanes," and not among his "Aplostomes"; but there is no Rule which implies that in order to be valid the type of Férussac's subgenus *Helicella* must necessarily be selected from among those species which he placed in a section thought by him to be most nearly equivalent to the supposed *Helicella* of another author, Lamarck. On the contrary, Article 30 (*a,b,d,e,g*) clearly seems to imply that when there is no type by "original designation" or "absolute tautonymy" any species which was originally included without question under the generic name may be selected as type by a subsequent author, and such designation is not subject to change. Consequently, as Férussac included without question *H. ericetorum* among his species of *Helicella*, the subsequent designation of that species as type cannot be rejected according to the International Rules. Therefore the application by Pilsbry and others of the name *Helicella* Fér. to the genus containing *H. ericetorum* Müll. seems to have been correct, and this name has priority over *Jacosta* Gray, *Helicopsis* Fitz., *Xerophila* Held, etc.

Helicopsis Fitz., and **Candidula** Kobelt.

In their last paper Gude and Woodward have acknowledged that the name *Helicopsis* Fitz. (1833) ought not to be used in a generic sense, as they had suggested; but it should also be pointed out that this name ought not to be applied to the subgenus *Candidula* Kobelt (1871), of which *H. candidula* Studer is the type, and to which the common British species *H. caperata* and *H. gigaxii* belong. The type of *Helicopsis* Fitz. is *H. striata* Müll., and in this species the reproductive system has a pair of dart-sacs and a pair of accessory sacs. On the other hand, in *H. candidula*, *caperata*, *gigaxii*, etc. there is only a single dart-sac.[1] This is an important difference, similar to the chief distinction between *Trichia* and the subgenus of *Hygromia* which Gude and Woodward have named *Monachoïdes* and which Hesse regards as a distinct genus.[2] Indeed the reproductive organs of *H. striata* seem to differ from those of *H. candidula*, *caperata*, etc., much more than do those of *H. virgata*. It is therefore evident that the name *Candidula* Kobelt is not a synonym of *Helicopsis* Fitz., but that *Helicopsis* and *Candidula* should be regarded as distinct subgenera or sections of *Helicella*.

It is true that Pilsbry, although he said that these groups would probably have to be separated, did not separate them himself, because of the number of species which had not then been dissected.[1] But the fact that there are still some Continental forms of which we do not yet know the affinities is not a sufficient reason for uniting in one group species which are definitely known to belong to different groups. A scientific classification should surely accord with what we do know rather than with what we do not know.

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[1] Schmidt: Abhandl. Naturwiss. Vereines f. Sachsen u. Thüringen, vol. 1, 1855, pl. vi. Boycott and Jackson: *Journ. of Conch.*, vol. xiv, 1914, p. 168; etc.

[2] Archiv f. Molluskenkunde, 1921, pp. 61—66.

Trochula Schlüter, and **Trochoidea** Brown.

Messrs. Gude and Woodward reject both of these names for the group of which *H. elegans* Gmelin is the typical species; and as *Turricula* Beck is preoccupied, they consider that the correct name of this subgenus is *Xeroclivia* Monterosato (1892). *Trochula* Schlüter (1838) is rejected because of *Trochulus* Humphrey (1783), for although the latter name is not valid they say: "Even if Humphrey's names in his 'Museum Colonneanum' be set aside, the name *Trochulus* is so sure to have been quoted in some work that it is safer to suppress it." But, as we have seen when discussing the names *Hygromia* and *Trichia*, the Recommendation of Article 36 precludes the rejection of *Trochula* Schlüter on account of *Trochulus* Humphrey which differs from it in its ending, even if the assumption that Humphrey's name was rendered valid by quotation prior to 1838 should prove to be correct. It is therefore evident that those who wish to follow the Rules and Recommendations of the International Code must use the name *Trochula* Schlüter in preference to *Xeroclivia* Monterosato, a name which was not proposed until fifty-four years later.

The name *Trochoidea* Brown (1827) is, however, older still; but it is rejected by Gude and Woodward apparently on the ground that it is doubtful whether Brown's *Trochoidea terrestre* should be identified with *H. elegans* Gmelin or with *H. fulva* Müll. A study of Brown's original work seems to show that it was *H. elegans* to which he gave this name. Brown's two drawings,[2] it is true, are very badly executed; but in the explanation which accompanies them he cites both Donovan and Montagu, thus:—"TROCHOIDEA terrestre, *Brown's* MSS. Trochus terrestris, *Mont. Test. Brit.*, p. 287.—*Don. Brit. Sh.*, pl. 111." Now the three figures on plate cxi in the fourth volume of Donovan's work clearly depict the banded form of *H. elegans* Gmelin, with which his description also agrees, although Donovan falls into the error of thinking that Pennant's *Trochus terrestris* must have been the species with which he is dealing. Montagu's *Trochus terrestris* was also *H. elegans* Gmelin, and not *H. fulva* Müll., for he describes it as having a livid-white, conical, umbilicated shell, with a strong keel, a flattened base, and a compressed, angulated aperture, the diameter of the shell being rather more than ¼-inch. He gives no figure of the species himself, but cites those of six other authors, as follows:—"*Br. Zool.* t. 80. f. 108. / *Don. Br. Shells.* iv. t. 111. / *Chem. Conch.* ix. t. 122. f. 1045. a.b.c. / *Lister Conch.* t. 61. f. 58. / *Favan.* t. 64. O. 1. 3. / *Petiver Gas.* t. 22. f. 10." The last four of these references are precisely those which Gmelin gives in describing his *H. elegans*[1]; they all seem to depict the common bandless mutation of that species. Donovan's plate, as we have seen, depicts the banded form of the same species, while in citing Pennant here, instead of under his *Helix trochiformis*—the name that he gave to *H. fulva* Müll.—Montagu simply followed Donovan in mistaking the identity of Pennant's species. In his remarks, however, Montagu is careful not to state positively that Pennant's species and his own are the same, but merely says:—"There can be little doubt that this is the same as that . . . communicated by Mr. Pennant." Turning now to Brown's two figures (which Gude and Woodward state "are evidently inventions") we find that, though very badly drawn, they appear to represent a whitish, pyramidal, perforate shell, very unlike *H. fulva* Müll., a species which he depicts on the previous plate, calling it *Helix trochiformis*, the name given to it by Montagu.[2] On the other hand, a comparison of Brown's figures with those of Donovan which he cites leads one to think that they are probably bad copies of two of Donovan's drawings of the shell named *H. elegans* by Gmelin, the dark band being omitted in conformity with Montagu's description.

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[1] Man. Conch. (second series), vol. i

[2] Illust. Conch. Gt. Brit., [illegible]

It is thus clear that both of Brown's citations refer to *H. elegans* Gmelin, and that his poor figures are not improbably modified copies of drawings of the same species; consequently there can be no reasonable doubt for what species the name *Trochoidea* was proposed, and Gray was right in stating that the type of Brown's genus was *Helix elegans*. Therefore, while the name *Trochula*, Schlüter has priority over *Xeroclivia* Monterosato, Brown's appropriate name *Trochoidea*, being older still, seems to be the correct one to use for the subgenus of which *H. elegans* Gmelin is the type species.[3]

Petasina Beck, and **Euconulus** Reinhardt.

Conulus Fitz. (1833) and *Petasia* Beck (1837) both have *H. fulva* Müll. as their type species, but both these names are preoccupied, therefore *Euconulus* Reinhardt (1883) is now generally employed in their stead. But Gude and Woodward state that *Petasina* Beck (1847) is the correct name to use for this genus, saying:—"*Petasia* being preoccupied was changed to *Petasina,* which takes of course the same type. Hence *Petasina* displaces *Euconulus,* Reinhardt." But if Beck proposed the new name *Petasina* to take the place of *Petasia* because he had discovered that the latter name was preoccupied, we might have expected some note to this effect in the paper in which he first published the name *Petasina*; but there is no such note, and nothing at all to indicate that the name was a new one. This suggests the possibility that the name was not intended to be new, but that the *n* was inserted into *Petasia* through an error on the part either of Beck or of his printer. And this supposition is rendered still more probable by the fact that in the same short paper *Hydrobia* is spelt "*Hygrobia,*" and Montagu is shortened to "Mutg.," instead of to Mtgu. —evident typographical errors. Now if this be the probable origin of the name *Petasina,* it must be suppressed according to the International Rules, as will be seen from Opinion 29, which says, in effect, that a name must be suppressed if it is probably a typographical error for another name which is preoccupied.

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[1] Syst. Nat., 1791, vol. i (6), p. 3642.

[2] The great dissimilarity between Brown's figures of the two species, which he rightly placed in different genera, shows that the naming of the figures of both forms "*Helix fulva*" in the second edition of his work, published seventeen years afterwards, must have been due to some error.

[3] It is interesting to note that although Pilsbry uses the name *Trochula* Schlüter, he writes: "The name proposed by Brown, in 1827, may prove to have first claim for this group," notwithstanding that he had not seen Brown's work. (Man. Conch. (2nd ser.), vol. ix, 1894, p. 262).

There is of course no proof that this view of the origin of the name *Petasina* is the correct one; the evidence is purely circumstantial. But Gude and Woodward give no proof that their view is correct; it seems to be a pure assumption. Moreover, as Beck did not say that he proposed the name *Petasina* as a substitute for *Petasia,* it can scarcely be maintained that, if it were intended to be a new generic name, he indicated that it must have the same type as *Petasia.* Therefore Gude's designation of *H. edentula* Drap. as the type of *Petasina* in 1911,[1] to which Dr. Pilsbry has kindly drawn my attention, would seem to be valid, if *Petasina* is not a typographical error; and in this case the name would have to be used, not in the place of *Euconulus,* but for the section of *Trichia* which Gude and Woodward have recently named *Petasiella.*

Evidently there is room for a difference of opinion in this case, but probably most zoologists will at least agree that a familiar name in current use ought not to be changed until some sort of proof has been brought forward that the proposed change is not contrary to the International Rules, but in accordance with them. As no such proof has been brought forward in the present instance, it would seem best to continue employing the name *Euconulus* for the genus of which the type species is *Helix fulva* Müll.

Oxychilus Fitz., **Polita** Held, and **Hyalinia** (Ag.) Charp.

Since it appears that the International Rules do not require the name *Helicella* to be transferred from the Helicidæ to the Zonitidæ in the manner suggested by Gude and Woodward, the generic name *Oxychilus* Fitz. (1833) would seem to be the best one to employ for *H. cellaria* Müll. and its allies. This name has priority over *Polita* Held (1837). Messrs. Kennard and Woodward were clearly wrong in stating that—"Unfortunately, the name *Oxychilus* is rendered untenable by the earlier *Oxycheila* of Dejean";[1] for, as we have seen, there is no Rule which implies this, but, on the contrary, the first Recommendation of Article 36 prohibits the rejection of names on this account when they have been once introduced. Gray, in Nov., 1847, was somewhat inconsistent regarding the type of Fitzinger's genus: on page 173 he gives it as *H. ericetorum*, but on the following page he says that Fitzinger's genus is equivalent to Beck's *Helicella* of which he states that the type is *Hel. cellaria*. Rather more than two months earlier, however, Herrmannsen had designated *Helix cellaria* Müll. as the type of *Oxychilus* Fitz.[2], which seems to settle the matter.

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[1] Proc. Malac. Soc., vol. ix, p. 362.

Perhaps it is fortunate that the name *Polita* Held, being of a later date, cannot be legitimately used for this group, for in the well-known works of Clessin[3] and Taylor[4] the name *Polita* has been applied to another group of species, comprising *H. nitidula* Drap. and its allies, which differs from the *cellaria* group in so many features of its anatomy that it is probably rightly regarded by Hesse[5] and others as generically distinct.

It is less fortunate that the familiar name *Hyalinia* (Ag.) Charp. cannot be retained for this genus if the Rules are to be followed. This name of course should not be rejected because of the earlier but slightly different names *Hyalina* and *Hyalinus*[6]; but like *Polita* Held it was not proposed until four years after the publication of Fitzinger's paper. Moreover, in Dec., 1852, Herrmannsen, in the Supplement to his Index of Genera, designated *H. crystallina* as the type of *Hyalinia* (Ag.) Charp. (1837); and as this species is generally admitted to be quite closely related to *H. diaphana*, the type of Fitzinger's genus *Vitrea*, de Charpentier's name *Hyalinia* becomes a virtual synonym of *Vitrea* Fitz. (1833).

SUMMARY OF CONCLUSIONS.

The foregoing considerations appear to show that those who wish, not only to classify snails in accordance with what is now known of their anatomy, but also to name them in accordance with the Rules and Recommendations of the International Code, adopting no changes which the Rules do not require, should use the following names for those groups of British snails with which the present paper is concerned:—

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[1] Proc. Malac. Soc., vol. xiv, 1920, p. 86.

[2] "Indicis Generum Malacozoorum Primordia," vol. ii, p. 183. (See note on p. 279 as to the validity of Herrmannsen's designations of types).

[3] Deutsche Excurs.-Mollusken-Fauna, 1884, p 87.

[4] Monogr L. and F.W. Mollusca Brit. Is., 1908, vol iii, p. 67.

[5] Nachr. Deutsch. Malacoz. Gesells., 1914, pp. 128—136.

[6] See argument under *Hygromia*. The present International Rules had not been drawn up when Smith wrote his paper on the nomenclature of this genus (*Journ. of Conch.*, vol. vi, 1891, pp. 337—339).

Family HELICIDÆ.

Genus *Hygromia* Risso, 1826. (Type: *H. cinctella* Drap.).
  Subgenus *Hygromia*, *s.s.*
    Section *Zenobiella* Gude and Woodward, 1921. (Type: *H. subrufescens* Miller=*H. fusca* Mont.).
    Section *Hygromia s.s.*
  Subgenus *Trichia* Hartmann, 1840. (Type: *H. hispida* Lin.).
    Section *Trichia s.s.*
    Section *Ponentina* Hesse, 1921. (Type: *H. subvirescens* Bellamy).
Genus *Helicella* Férussac, 1821. (Type: *H. ericetorum* Müll. = *H. itala* Lin.).
  Subgenus *Cernuella* Schlüter, 1838. (Type: *H. variabilis* Drap = *H. virgata* Da Costa).
  Subgenus *Helicella s.s.*
  Subgenus *Helicopsis* Fitzinger, 1833. (Type: *H. striata* Müll.).
  Subgenus *Candidula* Kobelt, 1871. (Type: *H. candidula* Stud.).
  Subgenus *Trochoidea* Brown, 1827. (Type: *H. elegans* Gmelin).

Family ZONITIDÆ.

Genus *Euconulus* Reinhardt, 1883. (Type: *H. fulva* Müll.).
Genus *Vitrea* Fitzinger, 1833. (Type: *H. diaphana* (Stud.) Fitz.).
Genus *Oxychilus* Fitzinger, 1833. (Type: *H. cellaria* Müll.).
Genus *Retinella* (Shuttleworth) Fischer, 1877. (Type: *H. olivetorum* Gmelin).
Genus *Zonitoides* Lehmann, 1862. (Type: *H. nitida* Müll.).

◆

Acanthinula lamellata var. **albida** and **A. harpa** near **Borås, Sweden.**— The white form of *A. lamellata* has not been described in scientific literature as far as I know. It is to be found on the slope of a range of hills just west of Borås in various places, especially in and about a rather great cleft situated about 200 metres above the sea, among mouldering twigs and leaves. You can also find the main form there, though in considerably smaller number. The form is quite invariable, because it has been observed and gathered by me for the last four years. Other species which are to be gathered there do not show any tendency to diverge in colour. *A. harpa* occurs in the same mountain chain. This habitat seems to be quite isolated from other localities in Sweden where the species is known to occur—the nearest is about 200 English miles further north. Here, according to my opinion, it must be considered as a relic from a late glacial period.—BERTHOLD SUNDLER.

A PECULIAR FORM OF HYGROMIA FUSCA (Montagu) FROM LEIGH WOODS (SOMERSET), NEAR BRISTOL.

By D. BACCHUS.

(Read before the Society, March 2nd, 1921).

DURING the autumn of 1920 Mr. Kennard mentioned in a letter to me that he required some *H. fusca* from the West of England. On receipt of this letter I paid a visit to a bank, where I generally manage to find some half dozen or more *H. fusca* each time I visit it. On the result of my catch being received by Mr. Kennard, he immediately asked if I would send some on alive to Mr. Hugh Watson, of Cambridge, for dissection as they were "totally unlike *fusca* from the North." I sent some twenty living examples to Mr. Watson who says in reply: "The shells differ considerably from what I take to be the normal form of the species such as one finds in the North of England. They are darker in colour and not so thin, slightly larger and have more slowly increasing whorls and a smaller mouth. A preliminary dissection shows that the reproductive organs are very like those described and figured by Taylor in his account of *fusca*, and the radula agrees closely with Bowell's figure. On the other hand, the colouration of the animal differs from Taylor's account." Shells collected by Mr. Watson some years ago from Leigh Woods and at Plymouth are more depressed than either my specimens or the type, though in some respects they are intermediate.

Fusca from South Devon and Glamorgan in my own collection, Mr. Watson informs me, are intermediate between the Leigh Woods specimens and those from Northumberland. Specimens taken, however, by Mr. Swanton some years ago in East Somerset, are without any trace of rufous colouring and very thin.

In a second letter Mr. Watson says, "It is not unlikely that your Leigh Woods examples may prove to be nearer the type of the species than the northern form which I have always looked upon as the ordinary *fusca*, for Montagu's original specimens came from the South of England, and it was from shells found near Bristol that Miller established his *H. subrufescens*, the name by which the priority purists now wish *fusca* to be known." Montagu describes the shell of the type as thin, pellucid, rufous, horn-coloured, and adds that Mr. Boys of Sandwich, favoured him with this species. Mr. Swanton, who informed me of the above description of Montagu, says of my specimens, "at first sight they almost suggest a cross between *fusca* and *hispida*." This is undoubtedly true: even under a lens I have repeatedly had to turn them over to see if it is *fusca* or a var. *depilata* of *hispida* from the same bank.

The only cause of this heavier calcification and redder colour that I can think of is the limestone soil and the amount of dead beech leaves about on which the mollusc appears to feed. The bank on which this shell is found is a limestone one facing north and very damp, but sheltered both above and from the opposite side of the road by trees. It is some six feet high, sloping at an angle of 45 degrees. The limestone cropping out here and there makes pockets which most of the year are filled with leaves. Above the bank is a mixed hedge of laurel, beech, birch, oak, sycamore, hawthorn, with a few furze bushes. The bank is covered with thick grass, the only other plant of note being the wild thyme. In about 40 yards of this bank I have also taken the following:—*Limax arborum; Arion ater*, var. *brunnea; A. subfuscus; A, hortensis; Polita lucida*, one; *P. cellaria*, common; *P. rogersi*, common; *P. nitidula*, common; *P. pura; Vitrea crystallina; E. fulvus*, one; *P. rotundata*, common; *H. hispida*, very common; var. *fusca*; var. *depilata*, very common; var. *alba*, one; m. *scalariforne*, two; one example looks from one view as if two *hispida* had been stuck one on the other; *H. striolata*, common, but small; also a whitish variety; *H. aspersa*, two dead shells; *H. nemoralis*, this shell is common and always very intense in colouring; type missing; var. *rubella*, 123(45), very common and heavily banded; as the spot is sheltered, damp and shady, this is what one would expect; var. *rubella*, 00300 and 00000, not rare; var. *libellula*, 00300 and 00000, not rare; var. *castanea*, a dark chestnut brown, common; var. *fascialba* (exactly like the illustration in Taylor's *Monograph*), one; var. *lateritia*, one; *H. caperata*, two dead shells; *E. obscura*, common and large; *Cl. laminata*, common; never below five feet from the bottom of bank when alive; var. *alba*, two or three examples; *Cl. bidentata*, common; *C. minimum*, common, on dead leaves; *Pomatias elegans*, not common; mostly var. *ochroleuca*.

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Pisidium lilljeborgii in Merionethshire and Denbighshire.—I am now able to add two counties to the known range of this Pisidium in Wales. In September I collected it in two Merionethshire localities: Llyn Gwernan, a tarn at 550 feet on the north side of Cader Idris, where it was associated with *Sphærium corneum*, var. *flavescens*, *P. nitidum*, *milium* and *hibernicum*; and Llyn y Garn, a mountain tarn at 1,450 feet in Cwm Prysor. In a gathering which comprised *amnicum*, *subtruncatum*, *pulchellum*, *henslowanum*, *nitidum*, *milium* and *hibernicum* that I made in the Shropshire Union Canal at Llangollen, Denbighshire, on Sept. 19th, Mr. A. W. Stelfox detected a single small but otherwise characteristic specimen of *lilljeborgii*. Its occurrence in such a place is interesting, for *lilljeborgii* has been regarded as living exclusively in mountain lakes and tarns.—C. OLDHAM. (*Read before the Society*, December 7th, 1921).

THE SIGNIFICANCE OF DOMINANT EUADENIATE HELICES IN AFRICA.

By J. W. TAYLOR, M.Sc.

(Read before the Society, March 1st, 1922).

PLATE X.

THE recent issue of a volume dealing with the Malacological results of the Congo Expedition, 1909-1916, organized by the American Museum of New York, calls for the special congratulation of the scientific world, not only on account of the really superb manner in which the work has been produced, but also, that the study of the molluscan material was so happily placed in the supremely capable hands of Dr. Pilsbry, resulting in large and important additions and corrections to our knowledge of Central African life, securely based upon the detailed examination and study of the animal organization.

The present volume deals exclusively with the land mollusca and embraces 370 pages of text and 23 plain and coloured plates, in addition to the 163 figures or maps in the text, illustrating the distribution and internal organization of the animals, as well as the morphological peculiarities of the shells.

More than 6,000 specimens were examined or dissected for the purpose of the present work, the 160 new species, subspecies and mutations, necessitating, from their unusual novelty, the institution of 29 new genera, subgenera and sections for their reception.

The whole collection represents 214 species and subspecies and brings up the known total of Belgian Congo snails to about 400 kinds.

Perhaps one of the most important results of the study of this great mass of material has been its influence upon our knowledge of the Helicidian groups and the geographical problems connected therewith, demonstrated by the fact that the predominant group of Helicids in the region investigated is proved to be Euadeniates of East Asiatic type, the nearest known, though remote allies being the Japanese genera *Trishoplita* and *Eulotella*, which are, however, specialized in a different way.

Prof. Pilsbry's classical hypothesis that there have been five chief periods or waves in the development of Helicidian life, separated from each other by enormous intervals of time, is now very generally accepted, and all these groups are here assumed to have primarily emanated from the most active evolutionary centre, and successively spread or are spreading over the whole globe ; the most ancient groups which are also the most primitive in structure having the widest and most discontinuous range, while the more modern groups follow in the order of their evolution ; the more modern the group, the more restricted, concentrated and compact the natural range, each group preserving its relative position in regard to its predecessors and successors.

The accuracy of the foregoing deductions is supported by the absence of any trace of the latest developed and most advanced group in any regions except those now inhabited by its constituent species, and establish that the characters of the group have been developed within the area or region now occupied, whereas fossil representatives of the earlier groups are actually known to exist in the strata of regions far removed from the area they now inhabit, so that the fossil evidence of their former existence in countries from which they are now far distant tends to prove the truth of their migrations therefrom.

Of these five great waves or periods of Helicidian evolution and migration only, three have hitherto been authoritatively recognized as dominant regional groups in Africa, and the happy discovery of the undoubted predominance of the Euadeniate Helices in the Belgian Congo by Prof. Pilsbry has established the accuracy of the belief held by myself and other students that a predominant Euadeniate centre would be eventually found to exist in or near the very region where Prof. Pilsbry has now clearly demonstrated its actual existence and dominancy.

To place Africa upon an equality with the other great continents of the world, in respect of its Helicidian fauna, it now only remains to detect there the presence of the Epiphallogonous group, which constitutes the third great Pilsbryan wave of Helicidian life, and which hitherto has not been regarded as an African group, and whose discovery there would practically complete and connect together, as far as physical obstacles permit, the radiating and advancing waves of molluscan life, thus tending fully to confirm the actuality of the successive life waves, and also the probability of their origin and emanation from a common centre.

Curiously enough a species "truly Epiphallogonous in structure" for which a new genus *Haplohelix* has been created, has been found at an altitude of about 12,000 feet upon the slopes of Mt. Ruwenzori, a mountain which lies quite beyond the eastern limits of the Congo drainage basin, and although this "truly Epiphallogonous" species is viewed by Prof. Pilsbry as probably a degenerate Euadeniate, it may easily belong to a laggard group of true ***Epiphallogona*** which has become isolated from the main body of their congeners, and compelled to ascend the mountain heights to escape the competition and encroachments of the later evolved and advancing Euadeniates. For although the learned author has laid it down as a law "that the active centres [of evolutionary activity] for land mollusks are invariably in or about mountain regions," yet this declaration is quite opposed to the teachings of Darwin and the views of other students of geographical distribution.

Mountain regions or lofty summits frequently harbour a rich and distinct fauna and flora, but these are usually due to the congregation there of the more primitive and weaker species which previously inhabited the surrounding country, and any change they may undergo will probably be in the way of structural adaptation to the special environmental conditions they may be compelled to endure, and are therefore more probably a mark of degeneration, rather than of progress, or as Darwin has so poetically expressed it "as the tide leaves its drift in horizontal lines, rising higher on the shore, where the tide rises highest, so have the living waters left their living drift on our mountain summits. . . . . The various species thus stranded may be compared with the savage races of men, driven up and surviving in the mountain fastnesses of almost every land, which serves as a record, full of interest to us, of the former inhabitants of the surrounding lowlands."

This remarkable book is, however, truly a veritable treasure-house of information on every aspect of the Central African land mollusca and it is the first book on that region which authoritatively and almost exhaustively treats upon those structural characters which are the most reliable basis of a truthful and natural classification.

With this fine volume as a forerunner we look forward with eager anticipation to the second volume, in which the freshwater species will be treated of, and which in addition will also be enriched by the final results of Prof. Pilsbry's philosophical study of the characteristics and relationships of tropical African mollusca generally.

NORTH GRANGE, HORSFORTH,
April, 1922.

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TWO MOLLUSCAN ASSOCIATIONS IN NORTH-EAST STAFFS.

By W. E. ALKINS, M.Sc.

(Read before the Society, November 12th, 1919).

A COMMITTEE of four was appointed in 1900 by the Council of this Society "to consider and, as far as practicable, to carry out collective investigation into the phenomena connected with the variation and life-history of land and freshwater mollusca" (*J. of C.*, vol. 10, p. 32). Two lists, each containing five subjects for enquiry, were published (*l.c.*, pp. 28 and 88), but unfortunately the committee did not receive "sufficient information on which to base a report," and did not seek reappointment for a third year (*l.c.*, p. 276).

Two of the selected subjects on the second list read:—"ii. Do *Tachea nemoralis* and *T. hortensis* occur together or separately? (1) in the same district, (2) in the same locality, (3) in the same kind of habitat?" "iii. Do *Clausilia rugosa* (*bidentata*) and *Balea perversa* occur together? What habitats are they usually found in?" The former association forms the subject of two short papers which appeared later in the same volume (p. 300: S. S. Pearce: The Association of *Helix nemoralis* and *Helix hortensis*; p. 302: R. Welch: The Association of *Helix nemoralis* and *Helix hortensis* in Ireland); while the latter is dealt with by R. Welch a few pages further on (p. 312: *Clausilia bidentata* and *Balea perversa* in Ireland).

1. H. nemoralis and H. hortensis.

The Rev. S. S. Pearce had only taken *H. nemoralis* and *H. hortensis* in association in five localities; it is, perhaps, significant that three at least of the five are situated in chalk or limestone districts.

He concludes that "as a rule the two species live in separate and distinct . . . habitats." On the continent he had taken both species in France and in Switzerland, in each case without association; the suggestion is made that in the Alps *H. hortensis* generally ranges higher than its ally—though why this fact should preclude association below the limit reached by *H. nemoralis* is, perhaps, not very clear.

Mr. Welch remarks on the general rarity of *H. hortensis* in Ireland. He had taken it in four localities:—

1. On quartzites at Portsalon, N.W. Donegal; *H. nemoralis* not taken.
2. From Ordovician rocks, capped with boulder clay, at Downpatrick, Co. Down; *H. hortensis* very rare outside, but predominating inside, the cathedral graveyard.

On Carboniferous Limestone at :—

3. Ardbraccan, Co. Meath ; *H. hortensis* abundant with a few of the other species.

4. Kells, Co. Meath ; *H. nemoralis* on the whole is more plentiful here than *H. hortensis*.

Mr. Welch says : "I agree with Mr. Pearce that where one species is plentiful the other is rare or absent."

On p. 304 is mentioned an exhibit by Mr. C. H. Moore of a series of *H. hortensis* and *H. nemoralis* found living in company at Dyserth, North Wales. H. Beeston (*J. Conch.*, vol. 12, p. 207, 1908) states that in the Grange-over-Sands district of Lancashire—a district in which limestone is one of the prevailing rocks—*H. hortensis*, which is scarce in the neighbourhood, "was never found associated with *H. nemoralis*, neither were the colonies of each near one another."

Speaking of *H. nemoralis* Mr. J. W. Taylor ("Monograph," vol. 3, p. 279) says : "Though usually not living in company with *H. hortensis*—being really less montane in habit, and shewing a greater capacity for prospering under other and more arid conditions, yet there are many undoubted instances of their living in company, sometimes in approximately equal numbers." Again, when dealing (*l.c.*, p, 331) with *H. hortensis*, "Though occasionally found occupying a common feeding-ground with *H. nemoralis*, it usually congregates in colonies unmixed with its ally, as it frequents moister and shadier localities, and is more sensitive to drought than *H. nemoralis*, which seems to prefer drier and more open situations."

The frequent association of the two species in the north-east of Staffordshire, in a district in which the geological and other conditions vary in an extreme degree within a limited area, will, the writer hopes, be of sufficient general interest to justify him in re-opening the subject.

The district over which the observations extend comprises the Churnet Valley and that portion of Staffordshire lying to the north-east of the Churnet Valley—generally speaking, the Churnet Valley and the Staffordshire moorlands. The eastern portion of the district is typical Carboniferous Limestone country ; round this comes a belt of Millstone Grit and Coal Measure grits and shales, a belt which widens out very considerably from south to north ; and finally, in the south and south-west of the area are found Triassic rocks—Bunter pebble-beds and sandstones. Nowhere in the area except on the limestone do *H. nemoralis* and *H. hortensis* occur, to the writer's knowledge, but along the roadside walls and hedgerows—a circumstance which very probably indicates that the two species have, relatively speaking only recently spread from the limestone on to the newer rocks around. Thus we have here all the geological conditions which can be desired to enable us to study the distribution of the species.

The occurrence of the two species separately and in association will be detailed first for stations on the limestone and then for non-limestone localities, coming in each case from north to south.

ON THE CARBONIFEROUS LIMESTONE.

1. Manor Farm Gorge, near Wetton, Manifold Valley. On the steep, arid slopes of Wetton Hill *H. nemoralis* occurs abundantly; the predominating form is of a rich deep purple-brown colour, and comes near the variety *olivacea* Risso, as figured in vol. 3 of Taylor's "Monograph," pl. 26; other forms are vars. *libellula*, *rubella* and albolabiate *albina* (two specimens); none of the shells seen possessed a single band. *H. hortensis* appears to be absent.

2. Thor's Cave, Manifold Valley. At the foot of the limestone cliffs on the west side of the valley both species occur in considerable numbers, and in roughly equal proportions. The *H. nemoralis* are bandless vars. *rubella* and *libellula* (the purple variety mentioned above is not present; it appears to frequent drier and more exposed situations), while the *H. hortensis* are typical or bandless.

3. Bunster Hill, Dovedale. Both species are found in abundance, and again in more or less equal numbers. *H. nemoralis* is again bandless, and belongs to the var. *libellula* or, as is much more frequently found, to the form so common in the Manor Farm Gorge. The *H. hortensis* are occasionally bandless, but most often five-banded, with little tendency to the coalescence of any bands; it is noteworthy that the second band is often very feebly developed.

4 and 5. At Cauldon and at Calton Moor *H. nemoralis* occurs very sparsely; vars. *libellula* and *rubella* are found. The Cauldon specimens, one or two of which have the band formula 00300, are the only ones taken by the writer on limestone in the county which possess bands. *H. hortensis* has not been found in either locality. The general appearance of the series of shells from each place is intermediate between that of a typical limestone and that of a typical non-limestone assemblage.

6. Ramsor Quarry, Weaver Hills. Again both species occur—accompanied here by *H. arbustorum*; the numbers of *H. nemoralis* and *H. hortensis* are again fairly equal. Of the former vars. *rubella* and *libellula*, all bandless, and of the latter typical specimens, with some coalescence of the bands, and bandless forms are found.

Thus on the limestone, of four localities in which these species are abundant, three yield both species in approximately equal numbers. An interesting feature is the prevalence of bandless *H. nemoralis*: typical "limestone" and "non-limestone" series may be distinguished at a glance. The width and intensity of the bands in *H. hortensis*, and the tendency of the bands to coalescence, are all, generally speaking, less marked in limestone localities than in other stations, though actually bandless shells are rather less frequent.

NON-LIMESTONE LOCALITIES.

1. Froghall. *H. nemoralis* alone found; vars. *libellula* 00300, *libellula-fascialba* 00300, *rubella* 00000, 1(2345); *rubella-fascialba* 00300.

2. Oakamoor.

(a). On the railway embankment north of the tunnel (var. *rubella* 00300) and near the cricket field (vars. *libellula-fascialba* 00300, *rubella-fascialba* 00300), a few specimens of *H. nemoralis* have been found—probably introduced. No *H. hortensis*.

(b). On the Star Road. *H. nemoralis* alone; vars. *libellula* 00000, 00300, (12)3(45); *rubella* 00300; *rubella-fascialba* 00300, and *roseozonata-roseolabiata* with very pale translucent bands, 12345, 00300.

(c). Near the Vicarage, Farley Road. *H. nemoralis* only; vars. *libellula* 00000, 00300; *libellula-albolabiata* 00000; *rubella* 00000, 12345, 123(45), 00300; *rubella-umbilicata* 00300.

(d). Above the New Lodge, Farley Road. *H. hortensis* abundant; *H. nemoralis* much less frequent, not more than one to eight. Of the former the band varieties 12345, (12345), (123)(45), (123)45, (12)3(45), 123(45), 1(23)45, 1(23)(45) have been recorded, and of *H. nemoralis* the var. *rubella* 00000, 00300 only.

3. Along the roadside from Farley, past Alton Park, *H. hortensis* occurs sparingly—vars. 12345, (12345), (123)45, and 00000 have been seen—but *H. nemoralis* has not been found.

4. Near Wootton Lodge two specimens of *H. nemoralis* have been seen—var. *rubella* 00000, 00300—but no *H. hortensis*.

5. Ellastone.

(a). On a steep roadside not far from the church *H. nemoralis* occurs in fair numbers—again unassociated with its ally—amongst a luxuriant growth of ivy and bluebells. Vars. *libellula* 00000, 00300, 12345, 123(45), 1(23)(45); *rubella* 00000, 00300, 12345, 123(45), (123)(45); and *castanea* 00300—the last-named a particularly fine shell—have been noted.

(b). In a dense patch of nettles by the side of the road leading out of Ellastone village on the way to Ashbourne, *H. hortensis* is to

be found abundantly, in association with *H. arbustorum* but not with *H. nemoralis*. The forms 00000, 12345, (12345), (123)(45), 1(23)45 (12)3(45) have been taken here.

6. Alton.

(a). Near Dr. Hall's surgery *H. hortensis* has occurred; the writer has no record of the forms, and has not seen any *H. nemoralis*.

(b). Amongst nettles and brambles by a garden just below the Roundhouse; a large colony of *H. hortensis* with very few *H. nemoralis* (perhaps one to fifty). Of *H. hortensis* the band varieties 00000, 12345, 1(23)(45), 1(23)45, 1(2345), (12345), and of *H. nemoralis* the var. *rubella* 12345, 00300 have been recorded.

7. Along the hedgerows near Gallows Green *H. nemoralis* occurs very sparingly; vars. *rubella* 003$_{3}$00; *rubella-fascialba* 00300. No *H. hortensis*.

8. Finally, on the roadside, Quixhill, Denstone, both species occur together, though not in any great abundance; *H. hortensis* is about twice as common as *H. nemoralis*. Of the former the writer has the vars. 12345, (12345), 123(45), 00000, and of the latter the vars. *libellula* 00000; *rubella* 00000, 00300. The *H. nemoralis* are particularly fine.

Thus there are at present known to the writer in non-limestone districts eight stations for *H. nemoralis* alone, three for *H. hortensis* alone, and only three where the two species occur in association—and in the case of two of these three *H. nemoralis* is greatly outnumbered by *H. hortensis*. The contrast with conditions on the limestone is thus very marked.

It is very probable that the stations enumerated in the above list will be added to in the future. The writer hopes to be able to continue his observations in this and other districts, and has only ventured to present this note in the hope of creating or stimulating interest in this and kindred problems more particularly, perhaps, among the younger members who have recently joined the Society in the Manchester neighbourhood, without desiring to hazard generalisation from too scanty data. Yet the facts above cited do seem to afford support, so far as they go, for the suggestion already advanced, that the two species we have been considering appear to have established themselves first in the limestone districts, spreading thence at a later date in a more or less sporadic fashion over the neighbouring areas, where they have become modified in the course of time in the direction of some general increase in size and of the development of bands (*H. nemoralis*), or of increasing the width of bands already present (*H. hortensis*).

2. Balea perversa and Clausilia bidentata.

Mr. Welch (*l.c.*, p. 312) details various Irish occurrences of *B. perversa* and *Cl. bidentata* separately and in association, and concludes that "it is not so much the geological formation as presence of trees or damp shelter of some kind that regulates the abundance of these two species and their association together. Trees and such situations are, on the whole, more plentiful in limestone areas in Ireland and *Balea* is for that reason, being an arboreal species, more plentiful in such situations, and *Clausilia*, being a common species in damp, and often in dry, situations all over Ireland is of necessity associated with the other."

So far as the writer's experience goes in N.E. Staffs. *Balea* is only to be found in isolated colonies on moss-grown walls—never on trees; indeed the only mollusca the writer has ever seen on trees in this district have been slugs! The presence of trees is by no means essential to the occurrence of the species. *Cl. bidentata* has been found under stones in a garden and in quarries; under the upper stones of walls; amongst grass roots on rock faces in limestone areas; under fallen wood, etc. Both species are more common on the limestone than away from it; the writer knows four colonies of *B. perversa* in limestone areas and only a single colony elsewhere; in the case of *Cl. bidentata*, five and two stations respectively. On the limestone the only species associated with *Balea* are the ubiquitous *P. rupestris* (Drap.) and *H. hispida* (L.); on the grit the accompanying species are more numerous—*H. arbustorum* (L.), *H. hispida* (L.), *E. obscura* (Müller), *P. rotundata* (Müller), and *Cl. laminata* (Mont.). Thus it has hitherto not occurred with *Cl. bidentata*; species found in association with the latter include, apart from slugs:—*V. pellucida* (Müller), *V. crystallina* (Müller), *V. nitidula* (Drap.), *E. fulvus* (Müller), *P. rupestris* (Drap.), *P. rotundata* (Müller), *H. caperata* (Mont.), *H. hispida* (L.), *H. lapicida* (L.), *H. arbustorum* (L.), *H. nemoralis* L., *H. hortensis* (Müller), *E. obscura* (Müller), *C. lubrica* (Müller), *J. cylindracea* (DaC.), *Cl. laminata* (Mont.), and *C. minimum* Müller.

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Limax flavus var. virescens Fér. at Reigate.—Last December (1921) a single specimen of the var. *virescens* Fér. turned up among the colony of var. *tigrina* Pini at Reigate.—LIONEL E. ADAMS.

Hyalinia lucida in the Isle of Wight.—On September 28th, 1921, I found three dead specimens—apparently killed by the drought—near Ventnor. A single white *Ena obscura* turned up at Brading next day. It may be also of interest to mention that whilst re-arranging a set of *Hy. nitidula* from Haselbeech, Northamptonshire, I found one shell had its umbilicus turned inside out like a small boil, but it was punctured.—W. A. SHAW.

THE SOUTH DEVON RACE OF HYGROMIA LIMBATA (Drap.).

By H. C. HUGGINS.

(Read before the Society, December 10th, 1919).

In July, 1917, Mr. A. S. Kennard was fortunate enough to take at Coombe in Teignhead, near Teignmouth, three examples of a mollusc which at first sight he referred to *H. limbata*. Subsequent comparison, however, with examples of that species from Northern France caused him to have doubts of the correctness of this identification, and as he could not spare the time to visit Devon for more specimens, I undertook a special journey, with the result that I obtained abundant material, enabling the question of identity to be settled satisfactorily. This occurrence has already been[1] recorded by Messrs. Kennard and Woodward.

Before dealing with its Devonshire habitat, a short description of the mollusc itself may not be amiss. It is not unlike *H. striolata*, but is darker in colour, has longer more delicate horns, and an appearance of almost waxen smoothness and finish lacking in the commoner species; when crawling among dead leaves the animal somewhat resembles a young *Arianta arbustorum*. The texture of the shell is glossy, with a smooth, rather fine striation; the umbilicus is narrow and deep, and in adult examples is often covered by the reflection of the lip. This species can always be distinguished from any other British *Hygromia* by its smooth even coiling, large reflected mouth, and slight peripheral keel, a feature much developed in young specimens.

The Devonshire *H. limbata* are, on an average, considerably smaller than those found in Northern France, 9 × 12 mm. being the usual size. They are subject to the usual fluctuations of shape and size, from which several varieties have been selected on the continent, all of which are found in Devon, except, of course, var. *major*. I have a specimen, 10 × 13½ mm., which corresponds to var. *major* in our Devon race, though smaller than the average examples in many parts of France. Of these, I have noted the following:—

var. **minor** Moquin-Tandon. — "Shell smaller, keel more marked." Devon examples, 8 × 10 mm.

var. **trochoides** Moquin-Tandon.—"Shell globose, conical." Devon shells, 11½ × 11 mm.

var. **depressa** Mabille.—"Shell globose, depressed, with very slightly raised spire, and deep sutures." Devon shells, 8 × 12½ mm.

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[1] Proceedings of the Malacological Society of London, August, 1918.

I also took a specimen which at first I considered might be merely a sport, but the subsequent capture of several specimens by Mr. H. Beeston has shown it to be a distinct variety. Its remarkable feature, the total absence of any peripheral keeling, causes it to bear a superficial resemblance to *H. striolata*.

var. **ecarinata** nov.—Whorls rounded, with no trace of keeling; peripheral band usually missing or faint.

In colour the Devonshire *H. limbata* varies (excluding the white variety) from deep bronze to pinkish or yellowish-white, almost always with a paler peripheral band and a violet or pinkish peristome. Described varieties :—

var. **typica** Germain.—"Shell yellowish, with a whitish peripheral band. Interior of mouth whitish ; peristome white." Very scarce in Devon. Mr. Kennard has taken a few examples.

var. **sarratina** Moquin-Tandon.—" Shell of a more or less deep reddish fawn." To this variety at least ninety per cent. of the Devonshire specimens belong.

var. **ferussina** Moquin-Tandon.—" Shell yellowish-white, with a reddish zone surrounding the white zone both above and below." Scarce in Devon ; in some specimens the reddish zone on reaching the mouth of the shell expands right across the whorl for a short distance.

var. **brunnea** Gassies. — " Brownish, almost opaque horn-colour, with the white band sharply defined." Common.

var. **unicolor** Germain.—Shell shining reddish-fawn, without the peripheral band." Mr. Kennard has taken one or two examples.

var. **albina** Moquin-Tandon.—" Shell whitish." Not uncommon, in this variety the whole shell is glistening transparent white with the peripheral band colourless and translucent. The animal is milk-white, but is scarcely a true albino, as it has the eyes bluish-grey, and occasionally a faint bluish streak in the dorsal area. I also took a few examples with a normally coloured animal in an albino shell, as occasionally occurs in *Hyalinia cellaria.*

Kennard and Woodward point out that the Devon shell agrees with the descriptions of the Southern French race, but that examples thence hardly agree with our shell by reason of their more pronounced peripheral band and lighter colour. They suggest, however, that these differences may be due to the nature of the soil. I think this to be undoubtedly the case. *H. striolata*, *Helicella caperata*, *Helix aspersa*, and all the species of *Hyalinia* found in the same locality are darker and redder in ground colour than in any other locality where I have collected ; so a similar variation should be expected in

H. limbata. Further some half-grown examples I kept in captivity on a chalky soil formed new growth of a different character, the new shell being lighter in colour, thicker, and more opaque; with the result that the peripheral band was thrown into far greater prominence. This was especially shown in several examples of the var. *albina*, which, instead of being glistening transparent white, became opaque shining white, like the var. *albina* of *Helix hortensis*, the peripheral band showing very clear and translucent by contrast.

Having now visited Teignmouth in January, early April, August, and October, I have had the opportunity of studying the habits of *H. limbata* at all seasons. It appears to be decidedly sluggish, though of an irritable and inquisitive disposition; if disturbed it soon comes out of its shell again, and does not appear particularly timid. It loves deep damp hedge banks, full of dead leaves, especially those of the elm, maple, and hazel, in the order of preference given, and occurs most abundantly under an inch or two of leaves from the road level to half-way up the bank. In hot sunny weather, however, it occasionally climbs high up, and suns itself in the bushes, as *Helix nemoralis* does on beech trunks on the chalk downs, but the position chosen is most peculiar. It does not seem to rest on the side of a stalk or stem, as both *H. striolata* and *Ashfordia granulata* do in the same locality, but chooses the middle of a wide leaf, preferably of the hazel or field-maple, and sits on the upper-side in full sunshine.

H. limbata is a fairly hardy species; it does not hibernate in South Devon in ordinary weather (I found it quite active in January, 1918), but some specimens I took home in October, 1917, did so in the colder climate of Kent, going into winter quarters in November and emerging in early April the following year. These specimens covered the mouth of the shell with a transparent colourless epiphragm, a practice also followed by the mollusc when æstivating; I dug out a large number of apparently quite healthy animals in this state in August, 1918, and think that it æstivates regularly.

H. limbata is undoubtedly gregarious; where it occurs at all it is the commonest species, but it is most capricious; a colony of hundreds will occupy ten yards of road, then perhaps there will be gap varying from a hundred yards to a mile. It is usually found with *H. caperata*, *A. granulata*, and *H. striolata*, but does not seem to associate with these species, its true associates being *Arion intermedius*, *Hyalinia cellaria*, and *H. lucida*, especially the last named. Its favourite spots are deep beds of dead aud decaying elm leaves, the white fungus with which these are covered being, I believe, its staple food in a wild state.

In captivity it is omnivorous, eagerly devouring lettuce and carrot (though I noticed it preferred the latter in a slightly decayed and mildewed condition) and even turning cannibal if overcrowded or kept short of food.

H. limbata is subject to the usual natural enemies of the snail tribe; it is eagerly devoured by the field mice that swarm in the Devon lanes, in fact, where it occurs the shell is more often found gnawed through in the characteristic mouse fashion than any other shell except *H. striolata* and *H. hortensis*. It is also eaten by birds. I only noticed three or four thrush stones near its haunts, but found by each of these two or three broken shells, together with an equal number of *H. striolata* and swarms of *H. hortensis*. I further found a dead specimen tenanted by a larval glow-worm (*Lampyris noctiluca*) and two of my captives were devoured by an immature *Limax maximus*.

Judging from the large number of very young and immature specimens I found in October, 1917, I believe its chief breeding time to be June and early in July; after breeding it æstivates and at this stage I fancy (from the great number of fresh dead shells found in autumn) that the greater part of the old animals perish. A few (possibly late examples of the previous year which have æstivated in a virgin condition) emerge alive in autumn and appear to produce a partial second brood. I found two copulating on October 3rd, 1917, but most unfortunately these were mixed with my other specimens and accidentally killed. A pair also copulated in a tin box in my pocket in January, 1918, but I regard this as being due to the abnormal heat caused by being carried for several hours in a crowded box; they were unluckily killed by a sudden frost so again I failed to obtain the egg. Mr. A. W. Stelfox, who succeeded in breeding *H. limbata* in captivity from examples I sent him in October, 1917, describes the egg and young as being very like those of *H. striolata*, without any trace of hair on the first shell.

My collecting dates appear to bear out my idea of the breeding time of the species; in early October it abounded from very young to almost adult, but very few had formed a lip; in January quite half were fully adult and most of the remainder full-sized or nearly so, with a few very young ones suggestive of a partial second brood; in April all were fully adult except for a similar small batch now half-grown, and in August all were adult or very young indeed, obviously newly hatched. The eggs are almost certainly laid on the damp decaying leaves in which the whole active life of the snail is spent.

Mr. H. Beeston, who visited the locality on August 20th, 1919, a wet day, noticed animals laying eggs in suitable places; but, as he again noticed the enormous number of recently dead adult shells, his observations tend to confirm my idea of the general breeding season being earlier in the year.

H. limbata does not seem to be found off the red limestone area, but within that limit it is locally abundant. I did not find any specimens until about a mile beyond the town on either side of the river, but after that it was to be found in colonies in almost every hollow full of dead leaves which was sufficiently high to prevent an accumulation of water. The metropolis of the species is around Coombe Cellars, but I found isolated colonies several miles from Shaldon, on the road towards Newton Abbot, and also a few in hollows high up the side of the hill leading towards Torquay. On the Teignmouth side of the river its range is equally extensive, but the much larger area covered by buildings makes its colonies decidedly scarcer.

This invariable disappearance of *H. limbata* in the proximity of a town negatives any idea of its accidental importation in rubbish, especially as most of the other species (*striolata*, *lucida*, *aspersa*, *hortensis* and *caperata*) common in the neighbourhood, and abundant in the grassy courts and gardens of Shaldon. Its range suggests that, like *A. granulata*, it is an old-established, somewhat unadaptable species receding before the march of building operations.

It is also interesting to note that our form of *H. limbata*, though differing but slightly from the Southern French race, is very distinct from the races found on the continent nearest Britain, which are best known to our collectors and would at first sight seem mostly likely to occur here.

Mr. Stelfox has suggested that the species is a pre-glacial arrival in Southern England, and hence resembles the examples from non-glaciated areas rather than the present northern continental race.

My thanks are due to Messrs. A. S. Kennard and H. Beeston for generously placing their notes at my disposal, and to Mr. A. W. Stelfox for his great help in breeding the species in captivity.

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Limnæa stagnalis in Edinburgh.—While in Edinburgh recently I paid a visit to Duddingston Loch, and took several specimens of *L. stagnalis*, along with *L. pereger*, and one specimen of *Sphærium corneum*. Referring to the recent edition of the Census, I was surprised to note that *L. stagnalis* had not been recorded from Edinburgh, vice county No. 83. It seems strange that such a prominent shell should have been missed just at the doors of a large centre like Edinburgh, wherein several well-known conchologists live, and it strikes me as possible that *L. stagnalis* may have been introduced here.—E. CRAPPER. (*Read before the Society*, November 2nd, 1921).

On ALOPIA CYCLOSTOMA (Bielz), A. CANESCENS (Charp.) and A. DEANIANA, n.sp.

By the Rev. Dr. A. H. Cooke.

(Read before the Society, December 7th 1921).

Plate IX.

L. Pfeiffer described, without figure, in P.Z.S., 1849, p. 135, a new species, *Clausilia cyclostoma*: "Habitat in Archipelago Koreano (Sir Edw. Belcher)." He described at the same time other species from the same place, similarly received, and said to come from the Cumingian collection.

In Malak. Blätt. 1855, p. 180 Pfeiffer lists his *Cl. cyclostoma* under *Nenia*, and in his Novitates i, Heft 8, 1856, p. 79–80, pl. 22, f. 15–18, he says:—"This species, which has never before been figured, seems so closely related to the preceding [*N. blandiana* Pfr.] that it must be concluded they have a common habitat. In the Cumingian collection it was labelled as from the Corean Archipelago, but Mr. W. Benson has also received it from S. America, and there is much to be said for this view."

Küster, Conchylien Cabinet, vol. I. (1857–60), Clausilia p. 212, repeats Pfeiffer's description, with habitat "S. America," and figures the shell on pl. 23, f. 16–19.

E. R. Sykes in Journ. Malac., v, 1896, p. 58 writes:—"*C. cyclostoma* was described by Pfeiffer from the Corean Archipelago; subsequently he stated that it was probably S. American, while in the Nomenclator Hel. Viv. [ed. 1881 (Clessin), p. 407, no. 645, *cylostoma* typ. error] it appears as from Venezuela, and a specimen in my collection is said to have come from "Quito, Peru," which I assume refers really to the Quito in Ecuador. The real habitat therefore remains uncertain."

Jousseaume, Bull. Soc. Philom. Paris (9) ii, p. 23, 1900, in a list of South American *Nenia*, places *N. cyclostoma* Pfr., with loc. Columbia in his collection.

Boettger, in Nachr. deutsch. Malak. Gesell. xli, 1909, p. 175, lists '*Nenia cyclostoma* Pfr. 1849' as from Venezuela, Ecuador and U.S. Columbia.

Pilsbry, Proc. Acad. Philad., lx, 1918, pp. 452–55, does not include *Cl. cyclostoma* Pfr. in his list of the Clausilia of Korea.

Pfeiffer's type specimens (three) are in the Mus. Brit. collection, and belong unquestionably to *Nenia*: it seems strange that Sykes did not refer to them. How the original error of referring the habitat to the Korean Archipelago crept in cannot now be determined, but the specimens are Cumingian.

E. A. Bielz, in Verh. Siebenb. Ver., lx, 1858, p. 147, described a new *Balea cyclostoma* from the Bucsecs, but when these non-clausiate Carpathian *Balea* or *Baleo-Clausilia* became classified as Clausilia, his name *cyclostoma* became preoccupied. Pfeiffer, Novitates ii, 1865, p. 265, pl. 66, f. 4–6, accordingly substituted " *Claus. Pomatias* Pfr. in coll. olim," and in the *Mon. Hel. Viv.* 1868, vi, p. 397; he has *Cl. pomatias* Pfr. in litt. as synonym of *Bal. cyclostoma* Blz. Clessin's 1881 edn. of the *Nomenclator* prints in error (p. 368) " *Alopia pomatias* Parr."

Boettger in Rossmässler's Iconogr., vi, 1878–9, p. 54, no. 1683 pl. 167, f. 1683, gives a full description of *Clausilia* (*Balea*) *pomatias* Pfr., and the species will now rank as *Alopia pomatias* (Pfr.).

Alopia canescens Charpentier.

Charpentier described, without figure, in Journ. de Conchyl., iii, 1852, p. 364, the shell to which Parreyss (a dealer in Vienna who acquired Ziegler's collections) was said to have given the ms. name of *canescens*, with habitat "Transylvania": — "Differt a praecedente [*straminicollis* Charp.], cui habitu persimilis, testa contractiore, subturrito-fusiformi, omnino laevigata, pruinosa; plicis palatalibus nullis. Alt. 13; diam. 4 mill."

Ad. Schmidt, Boettger, and Clessin all denote by the name *canescens* Charp. the species from the top of the Piatra Mare, which has *three* plicae palatales, and therefore cannot be Charp.'s *canescens*. The authors try to get over this by saying that two identical shells were sent by Parreyss to Charp. and Rossm. for description: some mixture of labels took place, and the shell described by Charp. (1852) as *canescens*, and by Rossm.[1] as *glorifica*, was not that to which Parreyss gave the ms. name *canescens*. However this may be, we cannot go behind Charp.'s description, which has priority, and the question arises, what species is it? Not many *Alopia* combine a smooth shell with absence of plicæ palatales and a length of 13 mm. Kimakovicz (Prodromus,' p. 28) refers to it the *Alopia* from the upper part of the Czukás; Bielz, his dextral form of *Balea lactea* (Verh. Siebenb. Ver. iv, 1853, p. 163) which he first described as *livida* Menke var. *lactea*, reputed to come from the Czukás, but whose true habitat turned out to be the Bucsecs.

I am inclined to agree with Kimakovicz, but a further difficulty lies in Charpentier's words 'cui [straminicolli] persimilis.' It is not easy to see a close resemblance between *canescens* (as thus understood) and *straminicollis*, a much larger shell (19 mm. long), with strong lamellae and plicae; if this objection is pressed, probably *canescens* Charp. will have to lapse from inability to be recognised.

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[1] Malak. Blätt., iii, 1856, p. 198.

Alopia deaniana n. sp.

Adolph Schmidt, Ueber die Baleen und baleaartigen Clausilien Siebenbürgens (Halle, Zeitschr. Gesamm. Naturw. viii, p. 407–413, 1856) named, without description, a var. *maxima* of *Clausilia livida* Menke.

In his "System der Europäischen Clausilien," 1868, he gave its dimensions, although a *livida* of the size named (23 mm. long) has never to my knowledge been found.

Rossmässler's Iconogr., iii, pp. 119–121, pl. 86, f. 952, 1859, discussed the position of *livida* var. *maxima* without further result.

M. von Kimakovicz, Verh. Siebenb. Ver. xxxiv, p. 60, 1883, "Beitrag," while admitting that the habitat of this form was still "in finsterer Nacht begraben," says that he has it in his collection labelled "Aus dem Kolzu galbinaru [the northern height of the Magura ridge], bei Tontjes, nahe am Königstein," which he submits is impossible, but prophecies that he will find it on the Bucsecs in an excursion he is going to make. He observes that the form *maxima* had no clausilium, and possessed only rudimentary plicæ and lamellæ.

Clessin (Molluskenfauna Oesterreich-Ungarns, p. 798, 1887) gives the habitat as "Kronstadt, am Felsengebirge Mogura (1376 m.) zwischen Bucsecs und Königstein." This is no doubt the true locality, for which we are indebted to Herr F. Deubel, of Kronstadt. "Magura" or "Mogura" is a common mountain name in Transylvania, and M. mare (big) and M. mica (little) often occur close together.

The Törzburg Mogura runs like a sharp razor edge for about 6–8 km. between Törzburg and Zernest. At Törzburg, at its eastern end, we find *plumbea* Rossm., the Schuler *Alopia*; at its western end, we have the Alopias, which live on or below the Königstein, *fussiana* Bielz and *lischkeana* Charp. *Livida*, a non-clausiate form, does not occur till the middle slopes of the Bucsecs, some 14 km. away. Why this non-clausiate form should occur on the Törzburg Mogura, in the immediate proximity of the clausiate forms on both sides, is a curious point, and is scarcely dealt with by the well known theories of von Vest.[1]

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[1] The true inter-relationship of these puzzling species of *Alopia* can never be understood apart from the question of their habitat. Everything depends on precision in noting correct localities. The earlier writers on the group were scarcely cognizant of this. Variation is almost endless, and forms of the same species from the top and the bottom of a mountain will differ so widely as to deceive the very elect.

Unfortunately, Kimakovicz in his "Prodromus" (Verh. Siebenb. Ver. xliii, pp. 19–58, 1893), for reasons he does not explain, substitutes the name *nota* Kim. for *livida* Menke, and regards *maxima* A. Schm. as a subspecies of *nefasta* Kim., a form peculiar to the Bratocia, which is many kilometres distant from the Törzburg Mogura. These vagaries may be disregarded.

A careful examination of specimens of *livida* var. *maxima* shows that it is not a var. of *livida*, but must be regarded as a distinct and new species. I propose to name it *Alopia deaniana*, after my friend Mr. J. Davy Dean, who has done good work on the *Clausilia* of this group, and who first noticed the internal differences between it and *livida*. There is already at least one *Cl. maxima* (Grateloup, Actes Soc. Linn. Bordeaux, x, p. 150, pl. 4, f. 17, 1838).

The shell of *livida* is invariably of a characteristic blue-grey, the blue tint being more or less marked. I have collected it in hundreds, from all sides of the Bucsecs, the Malajester Schlucht, the Fr. Deubel Weg, the Bucsoiul, the La Strunga Pass, from the Val Jepi and the Furnica in Roumania, and from the Mte. Vulkan in the Abrudbanya district.

As compared with *livida*, the shell of *deaniana* is narrower and more tapering, uniformly longer, suture less impressed, the characteristic white sutural band of *livida* narrower and less conspicuous, striations on body whorl always present, finer, and extending further from the outer lip, lip more decidedly patulous, colour dark-brown, never blue-grey (See pl. ix, f. 9). As regards internal development, the position of *A. deaniana* can best be appreciated by a comparison of some of the other non-clausiate species.

In *A. haueri* Bielz (the "simplest" form, probably a variety of *A. canescens* Charp.) there is no folding and scarcely any flattening of the columella.

In *A glauca* Bielz et auctt. folding and flattening are present to a slight extent.

In *A. livida* Menke a fold is well developed and the columella is flattened.

In *A. deaniana* the process is carried still further, and a columella groove is formed, into which the "proximal end" or tip of the clausilium could pass, if it existed.

In other words, *deaniana* represents the fourth term of a series of developmental changes, the ultimate occasion of which is the reception of a clausilium (See pl. ix, figs. 1–4).

No internal plicæ are present in any of these species, but in ***haueri*** there is a small lamella superior and faint traces (in some forms only) of a lamella inferior.

In ***glauca*** the lamella superior is fairly strong, but the lamella inferior is still somewhat more of callus than a fold, and is withdrawn internally.

In *livida* and ***deaniana*** both lamellæ are, as a rule, well-developed,[1] and the lamella inferior stands out well on the columella. See pl. ix, figs. 5, 6, 7, 8.

I doubt whether the new section ***Ithyption*** proposed by Mr. Dean (*Journ. of Conch.*, xv, p. 265, 1918) is necessary or desirable. He distinguishes it "by the absence of a clausium, by the absence or modification of the lamellae or plicae, and by the relatively straight columella." The two latter characteristics are too vague to differentiate a section, particularly in a group where modification of one or other of these parts continually occurs, not only in one species as compared with another, but in the separate species themselves. I, therefore, hold with Ad. Schmidt, Bœttger, Clessin, Kimakovicz, that no subdivision of the group based on these grounds can be maintained. As Clessin remarks (op. cit., p. 285), the general appearance of the species not provided with an apparatus for closing the mouth bears too close a resemblance to that of those which are so provided, added to the fact that absolutely no anatomical difference exists between the animals of the two sections, to make it possible to separate them satisfactorily.

Bœttger holds (Clausilienstudien, p. 25) and I entirely agree with him, that in *Alopia* we have, not a degenerate, but a survival of a primitive form of Clausilia, and that the abundance of Balea-like fossil forms, and the rare occurrence of true lamellæ in the then existing clausilium-bearing Clausilias, make it more than probable that all recent Clausilias are developed Baleas, and that this process of development, from poorly armed to richly armed forms, is in active working in the case of Alopia in the present day.

EXPLANATION OF PLATE.—Figs 1-4, Sections of the shell of *Alopia haueri* (1), *glauca* (2), *livida* (3), and *deaniana* (4), showing the gradual modification of the columella for the reception of a clausilium.

Figs. 5-8, the superior and inferior lamellæ in the same four species.

Fig. 9, *Alopia deaniana* n. sp.

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[1] In the case of *livida* some instability may be inferred from the fact that out of one hundred full-grown specimens from the Bucsoiul, taken at random, in seven the lamella superior was much under-developed, while in two it was scarcely discernible. Of fifty from the Malajester Schlucht, three had no lamella superior.

PROCEEDINGS OF THE
CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

507th Meeting, held at the Manchester Museum, January 4th, 1922.

Mr. G. C. Spence in the chair.

Paper Read.

"*Clausilia bidentata* (Ström) m. *dextrorsum* in Lake Lancashire," by W. E. Alkins, M.Sc.

Principal Exhibits.

By the Rev. L. W. Grensted:—*Vitrea cellaria* var. *albina* and *Helix hortensis* var. *albina-unicolor*, *lutea-unicolor*, and *albina* 12345; also var. *minor-albina* 12345 (14 mm. diameter), from Altcar Rifle Range, S. Lancashire; *H. nemoralis* var. *albina* 12345, *fascialba-rubella* and *fascialba-castanea* from Hightown Sand-hills, Lancs.; *Helicella virgata*, typical and var. *albescens*, *H. hortensis* var. *albina-unicolor* and *albina* 12345 from R. Alt débris, S. Lancs.

By Mrs. Gill:—Selection of rarer species of *Murex* including *gambiensis* and *thomasi*.

By Mr. G. C. Spence:—*Limicolaria saturata* Sm. from Nakuru, B. E. Africa.

The Special Exhibit was British *Clausilia*.

Accounts for the Year ended December 31st, 1921.

Income and Expenditure Account.

RECEIPTS.				£	s.	d.
To Balance from last account				8	4	10
,, Annual Subscriptions for 1921:						
137 at 10/-	68	10	0			
4 at 7/6	1	10	0			
1 at 6/-	0	6	0			
53 at 5/-	13	5	0			
	83	11	0			
Arrears	5	0	0			
				88	11	0
,, Sale of Publications ...				25	18	7
,, Donations towards cost of publishing of Census ...				129	16	10
,, Donations towards cost of Illustrations				6	0	4
,, Advertisements				1	19	6
				£260	11	1

EXPENDITURE.				£	s.	d.
By publishing and distributing *Journal of Conchology*:						
Vol. xvi. pt. 5	33	1	3			
,, pt. 6	129	16	10			
,, pt. 7	39	5	4			
				202	3	5
,, Authors' Reprints ...				11	5	2
,, Printing and Stationery				3	14	0
,, Expenses of An. Meeting				0	5	0
,, Warehousing Stock ...				1	5	0
,, Fire Insurance				0	10	0
,, Subscriptions:						
Malacological Society	1	1	0			
Lancs. and Cheshire Fauna Com.	0	5	0			
				1	6	0
,, Officers' Expenses:						
Secretary ...	5	5	8			
Treasurer ...	2	1	9			
Editor ...	0	14	0			
				8	1	5
,, Balance, being excess o. Income over Expenditure				32	1	1
				£260	11	1

Life Membership Fund.

	£	s.	d.		£	s.	d.
To amount of Fund, Jan. 1st, 1921	111	11	8	By Commission on Purchase of Stock	0	1	3
,, Two Composition Fees at £6 6 0	12	12	0	,, Amount of Fund, Dec. 31st, 1921	131	12	11
,, Donations by Life Members	2	2	0				
,, Dividends and Interest	5	8	6				
	£131	14	2		£131	14	2

BALANCE SHEET.

Liabilities.	£	s.	d.	*Assets.*	£	s.	d.
Annual Subscriptions paid in advance	9	17	6	4% Funding Loan, £164 10 11 cost	125	0	0
Life Membership Fund ...	131	12	11	Cash at Bankers	48	11	6
Balance of Income and Expenditure Account ...	32	1	1				
	£173	11	6		£173	11	6

NOTE.—Assets in addition to those set out in the Balance Sheet are (*a*) Library, (*b*) Cabinets and Collections; (*c*) Stock of unsold Publications; (*d*) Annual Subscriptions in arrear.

CHAS. OLDHAM,
Hon. Treasurer.

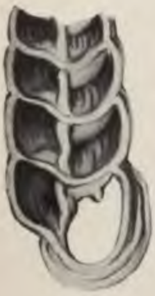
Audited and found correct, January 4th, 1922.

C. H. MOORE, A. K. LAWSON, } *Auditors.*

Physa heterostropha Say, **in Middlesex.**—A correction. Shells from the river Brent were recorded as *P. acuta* in *J. C.* xv, p. 233. The identification was an error. The shells bore considerable resemblance to *P. acuta*, but the animals (when examined) proved that they were *P. heterostropha.*—J. E. COOPER. (*Read before the Society*, Sept. 7th, 1921).

Pisidium clessini Surbeck, **in Scotland.**—Referring to my notice of this species in the *J. of C.* xvi, p. 221, I should like to record that Mr. B. B. Woodward has sent me specimens from Loch Ness, Inverness, taken at a depth of 400 ft. (= *P. pusillum* Woodward 1913).—N. H. ODHNER.

JOURNAL OF CONCHOLOGY, VOL. 16, NO. 9, JUNE, 1922. PLATE 9.



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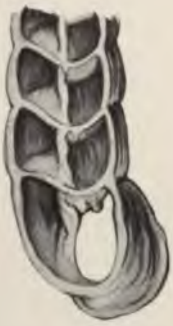

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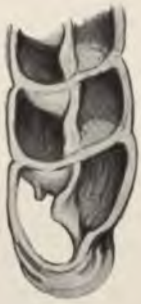

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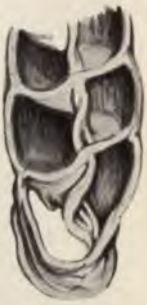

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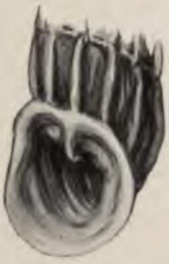

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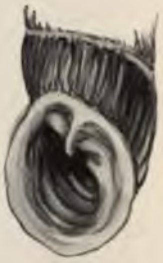

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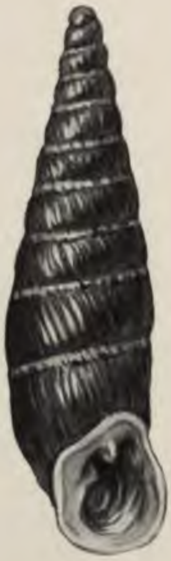

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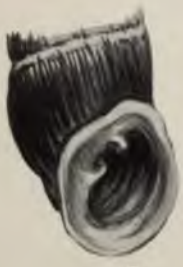

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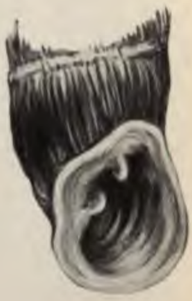

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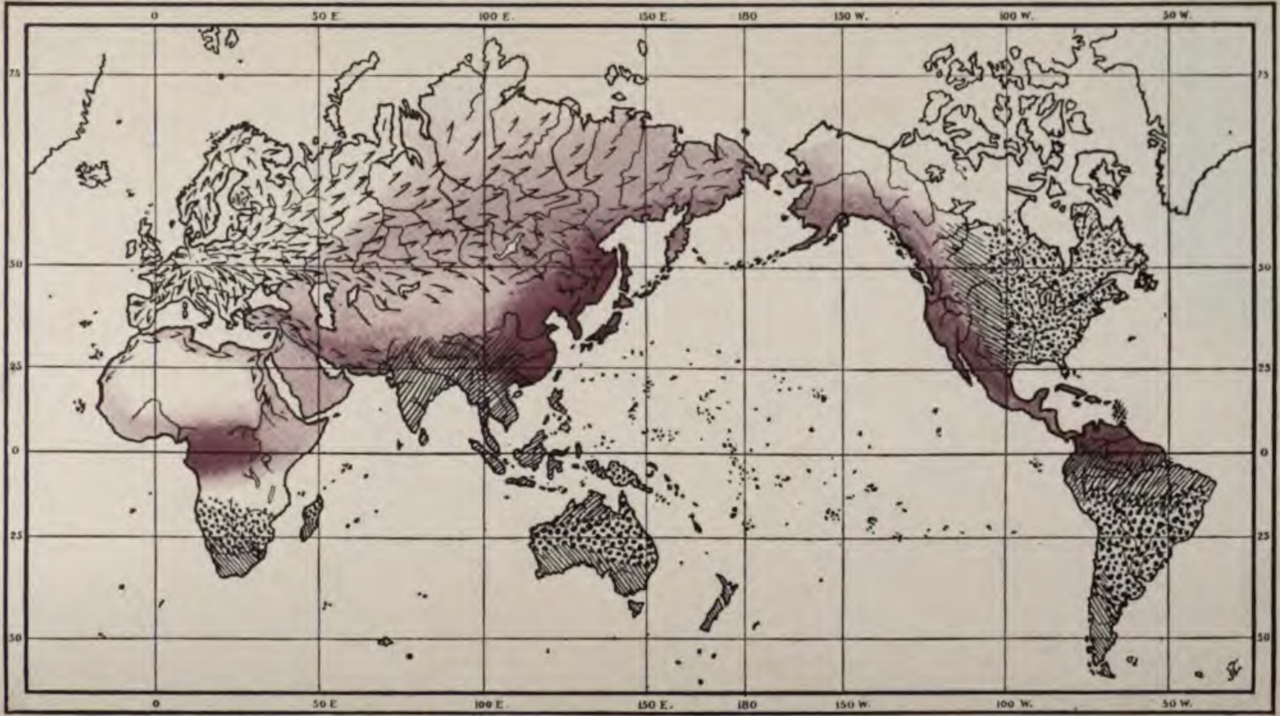
J. Davy Dean, *del.*

JOURNAL OF CONCHOLOGY, VOL. 16, NO. 10, OCTOBER, 1922.

PLATE 10.

WORLD-DISTRIBUTION OF THE CHRONOLOGICALLY SUCCESSIVE WAVES OF HELICIDIAN LIFE.

INDICATING THE AREAS WHERE EACH GROUP IS CHARACTERISTIC AND LOCALLY DOMINANT AT THE PRESENT DAY. *(See p. 288).*



Haplogona. ▧ Protogona. ⠿ Epiphallogona. ▨ Euadenia. ■ Siphonadenia. ⇗

The **Haplogona** is the most primitive group and the first migratory wave of Helicidian life; its dominancy is now restricted to the most widely distant regions.
The **Protogona** constitute the second great wave of Helicidian life, and though dominant over the Haplogona is largely confined to primitive regions.
The **Epiphallogona** are the third great migratory wave. It is now only dominant in India, the northern parts of Australasia and South America
The **Euadenia** are the fourth wave. Its dominancy extends over all its Helicidian predecessors and is only subordinate to the Siphonadenia.
The **Siphonadenia** is the fifth and latest life wave and occupies the most active evolutionary area. It is

THE
JOURNAL OF CONCHOLOGY.

VOL. 16. OCTOBER, 1922. . No. 10.

SOME USES OF SHELLS IN THE BELGIAN CONGO.

BY F. M. DYKE, B.Sc.

(Read before the Society, May 6th, 1922).

DURING a recent visit to the Congo I made the following notes on the use of shells by the natives :—

1. **Olivella mutica** Say.—This West Indian species together with others was formerly imported in large quantities by traders, and like the cowry was commonly used as money, but since the Belgians took over the country and made barter illegal, one finds them used only as ornaments. This particular *Olivella* is locally known (in the Kwango district) as "Zimbu" and some hundreds will be attached to a baby's "wool" by inserting a wisp of hair in the mouth of the shell and fixing it with a daub of clay.

2. **Cypræa moneta** L.—Ground flat on the dorsal side is largely used for the popular gambling game of "Jiggi," which, with many variations, is played as follows:—A native places a coin on a grass mat. His left hand neighbour then throws the set of four cut cowries when, if they turn up "2 and 2" (*i.e.* two "cut" faces and two "teeth") the thrower takes the stake and restarts the game by making his gamble for his left hand neighbour's throw. If he loses his first throw he places in the pool a sum equal to the first player, and hands the shells to his left hand man. Thus each throws and gambles in turn round the circle and the first to throw "2 and 2" (or other nominated combination) takes the pool. The Congo native works his hardest at this game. and once well started will stake all he has, and has been known even to bet himself into slavery.

3. **Achatina.**—As is well known these large, handsome shells are much used for decorative, domestic and talismanic purposes, but at Banga—a village on the left bank of the Congo opposite the mission of Yalemba, near Basoko—large species are put to what appears to be a novel use. The central spire is largely hollowed out, a stick inserted and suspended from a light rod which in its turn is connected by a string to the native canoes ("pirogues"). This arrangement acts as a signal in the event of a canoe breaking adrift when the rattling of the shells makes quite a good warning.

THE HELICOID GROUP CALLINA Lowe.
Description of a New Species.

By Prof. T. D. A. COCKERELL.

(Read before the Society, April 8th, 1922).

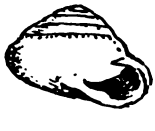
The generic or sub-generic name *Callina* was founded by Lowe for *Helix rotula* Lowe, a peculiar species confined to the small island of Porto Santo. For the group of *H. obserata* Lowe and *fausta* Lowe, confined to Madeira, he established the sub-genus *Rimula*, but this name is pre-occupied. Pilsbry, in his guide to the study of Helices, united *Rimula* with *Callina* as a single section of the sub-genus *Actinella* Lowe. For the genus, including this and other sub-genera, he used *Geomitra*, erroneously supposing that the earlier *Ochthephila* Beck was pre-occupied.

It must be confessed that *O. rotula* stands conspicuously apart from the others. It is a comparatively large shell, and when immature is sharply keeled, with a very narrow aperture, the outer wall fortified within by a strong white callus, and the opposite parietal wall also presenting a distinct callus. This immature state might be taken for the adult of a distinct species, on casual inspection. I described the soft parts of a *rotula* from the top of the Pico do Castello as follows:—Animal pellucid, with a pale reddish tint, greyer dorsally, with the usual dark bands from tentacles; mantle pale, with margin of respiratory orifice opaque white; oculiferous tentacles dark grey; two grey spots on front of head, and a grey dot above each.

The species of *Rimula* I did not observe alive. Whether they deserve a distinctive name is at present uncertain. The four species and two varieties of *Rimula* hitherto described are from Madeira, but I have been surprised to find one in the Pleistocene deposits of the main island of Porto Santo. This shell, which I had mixed with a quantity of *Ochthephila compacta portosanctana* (Lowe), may be described as follows:

Ochthephila (Callina) crassiuscula sp. nov.

Shell with max. diam. 6, min. 5·2, alt. 4·1 mm.; very thick, low conoid, with obtuse convex spire; whorls rounded, without any keel; whorls about six, slowly increasing, smooth, without granules (but abraded); short coarse plicæ on the last two whorls below the suture; base flattened, little convex; lip very thick with a rather short basal callus within, apically descending gradually, not truncate; no well defined parietal callus; aperture rather narrow, semi-lunar, except for the interruption of the outline due to the basal callus; umbilicus entirely closed, covered by a large spreading callus, broader than that of *O. obserata*.



It seems desirable to add a note on the systematic position of the genus *Ochthephila*, which has remained obscure in the absence of any knowledge of the genitalia. I obtained a very good series of the soft parts of a number of species, which I handed to Dr. Pilsbry for detailed description. On dissecting a specimen of *O. pulvinata* (Lowe), from the north side of Porto Santo, I find a highly developed epiphallus, but no dart-sac or filiform glands. The characters are those of Pilsbry's group Epiphallogona, which in his phylogenetic diagram he makes ancestral to the Belogona. Thus it would appear that *Ochthephila* represents the survival of a type of Helicidæ which is now mainly developed in the Oriental and Australian regions. It is to be said, however, that I find in *O. pulvinata* a slender cylindrical organ about 1120 microns long and 110 broad, which appears to correspond exactly in position and in shape (though very much smaller) with the cæcum or supposed degenerate dart-sac of *Theba cantiana*. If this structure is really a degenerate dart-sac, then *Ochthephila* may be a member of the Belogona which, through degeneration, simulates the Ephiphallogona. The spermatheca in *O. pulvinata* is large, claviform, not at all boot-shaped. The penis (within the sheath) is very obtuse and rounded, at least in the specimen examined.

When in Porto Santo, I superficially examined the anatomy of *O. consors* (Lowe), and also found no dart-sac. In *consors* the stout flagellum terminates in a nipple-like papilla.

◆

THREE CEPHALOPODS NEW TO DORSET.

By T. EDWARD BELCHER.

(Read before the Society, April 8th, 1922).

THE under-mentioned are not recorded in Mansel Pleydell's "Mollusca of Dorset," and unless they have been found since the publication of that work, in 1898, are new records for the county :—

Spirula peroni (Lamarck).—An imperfect shell, picked up at base of sand dunes, on a shell bed, Studland Bay, 26th July, 1921. The shell bed is thrown up by rough seas, usually during the winter months, and later covered with blown sand. In turn this is removed by a strong N. or S. wind, leaving, for awhile, the bed exposed.

Sepia elegans (Orbigny).—Up to the present, I have found only the sepiostaires of this species, unfortunately all more or less damaged, owing to their extreme brittleness.

According to my notes for the past six years they are washed ashore only during the first two months of the year. On February 4th, 1921, there were many all along h.w.m. in Studland Bay. The animal, no doubt, is also thrown up, but there is very little likelihood of specimens being found on the shore, owing to the number of gulls, which frequent this coast at all seasons of the year.

Polypus vulgaris (Lamarck).—On September 16th, 1919, I came across a dead, but perfectly fresh specimen, lying on the south shore of Poole Harbour, about one mile from the mouth. The animal measured between six and seven inches in length.

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Crepidula fornicata (Linné) **in Dorset.**—This gasteropod is not given in Mansel-Pleydell's "Mollusca of Dorset," a work published in 1898. If this species has not been recorded since that date, it may be of interest to know that I found a small live specimen, measuring ½ × ⅜ inch, attached to a piece of coal, thrown up on the beach, in Studland Bay, Nov. 5th, 1920. There is a bed of *Ostrea edulis* (L.) outside Poole Harbour, about two miles N. of the spot where I found my specimen. Here perhaps a colony may exist. During May and June 1917, I received seven old shells from my late brother, who picked them up near Cumberland Fort, or on the S.W. corner of Hayling Island. To my knowledge, this is the nearest locality where shells have been found.—T. EDWARD BELCHER (*Read before the Society*, April 8th, 1922).

◆

On Sunetta hians (Reeve).—This shell is described in the monograph of *Meroë* in the Conch. Icon., vol. xiv, pl. 3, f. 12 a,b,c, March, 1864, from Bombay, and the type specimens are in the Cuming collection. The name, however, cannot stand as it is anticipated by the *Venus hians* of Wood's Index Test. Suppl., pl. 2, f. 11, 1828, which is also a *Sunetta*. I suggest, therefore, that Reeve's species should be renamed *S. tumidissima*. *S. hians* Wood is a synonym of *S. solanderii* Gray in Thomson's Ann. Phil., n.s., vol. xi, p. 136, 1825. Gray misquotes Wood's name as *Venus hynans* in the Analyst, viii, 303.—J. R. LE B. TOMLIN (*Read before the Society*, 2nd September, 1922).

ON THE ASSOCIATION AND NON-ASSOCIATION OF HELIX NEMORALIS Linné AND HELIX HORTENSIS Müller.

BY W. CARTWRIGHT, O.B.E., M.Sc.

(Read before the Society, May 6th, 1922).

INTRODUCTION.

IN a recent paper to the Conchological Society W. E. Alkins gave an account of the association and non-association of *Helix nemoralis* Linné and *Helix hortensis* Müller in N.E. Staffordshire; in conclusion the author appealed for more data and it is with the object of placing on record some further material that the present paper has been written. At the present time we do not know to what cause or causes the distribution of the various species is due, and *H. hortensis* and *H. nemoralis* have been selected because they are found associated and in separate colonies in stations which, at first glance, appear to possess the same essential features. It is hoped, therefore, that a detailed study of the habitats of these two species in the Buxton district of Derbyshire will bring to light some facts that will serve to elucidate the problem of their association and non-association.

All the stations which are discussed in the following pages are situated on the Carboniferous Limestone, which is exposed in a broad anticline, the axis of which passes between Buxton and Millers Dale.

MILLERS DALE.

A considerable colony of *H. nemoralis* and *H. hortensis* occurs on the bank lying in the angle formed by the Litton and the lower Tideswell roads and another, though smaller colony, is found on the roadside just above the Tideswell road.

The habitat of the former colony consists of a steep bank with a south aspect covered to within a few yards of the bottom with long coarse grass which then gives place to a much shorter and finer variety. The upper portion of the bank is more damp than the few yards immediately above the Litton road, a circumstance due in a large degree to the fact that the drainage from the Tideswell road flows on to the top of the bank. Along the upper portion of the bank mud, washed from the road above, has accumulated below the drainage holes, forming mounds which extend for some yards down the hillside; these mounds are always covered with a bed of nettles (*Urtica*, sp.) with occasionally brambles (*Rubus*, spp.) and wild sage (*Salvia*, sp.). Along the lower and drier portion of the station, the underlying limestone frequently crops out.

External conditions have thus divided this habitat into two more or less distinct parts and this reflects on the distribution of the molluscs. It cannot be said that *H. nemoralis* and *H. hortensis* are truly associated in this area; although *H. hortensis* occurs over the whole area from the Tideswell road to within a few yards of the lower road, it is only very occasionally that *H. nemoralis* is found with it. Over the remaining few yards the reverse is true: in this small band *H. nemoralis* is found in large numbers, while the smaller species is of much less frequent occurrence.

Before passing on to a consideration of the second colony it may be of interest to note the frequency with which the several varieties of the two species occur. In the case of *H. hortensis* the ground colour varies from a pale to a rich yellow and out of one thousand (1,000) specimens two hundred and eighty-five (285) were devoid of banding, while the remaining seven hundred and fifteen (715) had almost without exception the normal complement of bands. In the case of the banded forms, there is a noticeable tendency towards a thinning out and ultimate disappearance of the second band. Among the pentatæniate shells, coalescence of the various bands frequently occurs; band varieties which have been noted include the following:—
123(45), 1(23)(45), 02345, (12)3(45), (123)(45), (12345), (12)345. Of the *H. nemoralis* by far the majority were found to belong to the variety *libellula* 00300, and of one thousand (1,000) specimens nine hundred and nine (909) were of this form; of the remainder thirty-seven (37) were *rubella* 00300 and fifty-four (54) belonged to the variety *libellula* 00000. In addition to these varieties two shells of the variety *rubella* 00000 and one each of *libellula* 12345 and *libellula* 123(45) were found.

The difference between the habitat of this colony and that above the Tideswell road is very striking: in the latter case we have a grassy bank broken here and there by miniature limestone cliffs, on which is found a much more varied flora than is met with below the road. Here in addition to grass and nettles are found vetches, several species of moss together with some of the commoner roadside plants. In this colony we can say that the two species are truly associated for they are found side by side throughout the whole colony; although *H. hortensis* is more frequent it cannot be said that the percentage of one species is higher in one part of this colony than in another. As in the neighbouring colony only two varieties of *H. hortensis* and three of *H. nemoralis* are found, but in the case of *H. nemoralis* the variety *rubella* 00300 is much more numerous.

In both stations *H. arbustorum* abounds; in the first area it is confined almost entirely to the nettle beds which cover the mounds of mud, but in the second colony it is found associated with *H. nemoralis* and *H. hortensis* throughout the whole of the habitat.

RAILWAY ARCHES, MILLERS DALE.

On the west side of the station road just below the railway arches a colony of *H. hortensis* exists. The area in question is almost wholly covered with nettles and *Centaurea nigra* interspersed with grass, *Plantago lanceolata*, brambles and the commoner roadside plants; a quantity of road mud thrown on to the bank retains the moisture and renders the situation somewhat damp. *H. hortensis* is numerous throughout the whole of the habitat, but *H. nemoralis* is not found in this area. Again we find that *H. arbustorum* is associated with *H. hortensis*, both species being present in approximately equal numbers.

DUKE'S DRIVE, BUXTON.

Along the top of the disused limestone quarry not far from the railway arches a small colony of *H. hortensis* is found. The colony extends towards the path leading to Higher Buxton, but it is confined to a narrow band, about three feet (3 ft.) wide, above the wall separating the field from the road. The whole area is covered with long grass and possesses a moderate flora of which *Heracleum sphondylium*, *Chærophyllum temulum*, *Centaurea nigra* and *Plantago lanceolata* are the most numerous. Only yellow shells are found, although there is a considerable variation in the banding of the shells. Throughout the whole of the habitat *H. arbustorum* is numerous, but *H. nemoralis* is not found in this colony.

DEEPDALE, NR. BUXTON.

On the west side of Deepdale from a point directly opposite the cavern to the stile leading to King Sterndale a considerable colony of *H. nemoralis* and *H. hortensis* occurs. The greater part of the steep valley-side is covered with moderately long grass with few other plants; over the whole area the underlying limestone frequently crops out. The top of the hillside is wooded and at one point the trees continue for some distance down the bank forming a V-shaped salient. In the vicinity of this salient the vegetation undergoes a marked change, the grass here being accompanied by *Mercurialis perennis*, while at the same time the ground is no longer dry, but appears to be damp, even in the driest weather. In wet weather a stream flows down the valley, but for the greater part of the year its bed is dry and is covered with nettles and meadow-sweet.

Here again we notice that the habitat divides itself somewhat naturally into two areas: (*a*) the ground in the immediate vicinity of the salient, (*b*) the remainder of the slope, each with its own flora. As in the case of the first Millers Dale colony the two species do not associate throughout the whole of the habitat and we find that *H. hortensis* is only found in any numbers in the first area mentioned, while *H. nemoralis* is found in both areas although it is not so frequent in the damp as in the dry area. *H. nemoralis* does not appear to prefer any particular part of the valley side, but is found equally distributed over the whole length.

On either side of this habitat *H. nemoralis* is found, but here it appears to occur only in the neighbourhood of the out-cropping limestone which now appears in much larger masses; *H. hortensis* is no longer found.

In this colony six varieties of *H. nemoralis* are found, the percentage frequency—calculated from five thousand (5,000) shells that have been collected—being:—*rubella* 00300 1·3, *rubella* 00000 6·9, *castanea* 00000 11, *libellula* 00000, *albolabiata* 5·1, *libellula* 00300 3·4, and *libellula* 00000 72·3. One or two shells of the variety *castanea* 00000, *albolabiata* and *rubella* 00000, *albolabiata* were also found; the frequency with which shells possessing more than one band occur is one per thousand. Here we have an entirely different distribution from that at Millers Dale, where the majority (91 %) of the *H. nemoralis* were *libellula* 00300; however, in both colonies the percentage of *rubella* 00300 is very small. From a study of the shells collected several very interesting points were noticed:—(*a*) there was a tendency towards pink and paler lips in the variety *castanea*, this tendency apparently not being present in the variety *rubella*; (*b*) the occasional development of teeth in the mouth, one or two teeth being sometimes found just inside the peristome, near the suture; (*c*) the tendency for the lip to become thickened, with formation of a small but definite umbilicus; (*d*) that white lips were only present, in any number, in the variety *libellula* 00000. In the case of *H. hortensis* only the type was found although both the ground colour and the banding varies.

Once again we find *H. arbustorum* present, but it is confined to the damper area and the nettles in the river bed. On the limestone face at the top of the hill *H. lapicida* is found.

THORPE CLOUD.

In the hedgerows on either side of the road from Thorpe Cloud to Ashbourne a colony of *H. hortensis* and *H. nemoralis* has established itself. At the bottom of the hedge-banks is a grass-grown ditch and practically the whole length of the habitat is shaded by overhanging trees; here we have a typical roadside flora. In this instance we find that the two species of molluscs live together side by side and exhibit little or no tendency to separate into two colonies and in this habitat they can be said to be truly associated.

In the case of *H. hortensis* only shells with yellow ground colour are to be found, but in the case of *H. nemoralis* the varieties *libellula*, *castanea* and *rubella* were seen.

In this colony *H. hortensis* is more numerous than the latter species; as in the other cases considered *H. arbustorum* is plentiful, being quite as numerous as *H. hortensis*.

CAVEDALE, CASTLETON.

On the Castle (north) side of Cavedale a small colony of *H. hortensis* and *H. nemoralis* is found. The hillside is covered with moderately long grass; the limestone frequently crops out and gives to some areas a stepped appearance. Along the top nettle clumps are found, but the area in question has little or no variety of plant life. *H. nemoralis* is found over the whole of the habitat and is represented by the varieties *libellula* and *rubella*, but although odd shells of *H. hortensis* are found throughout the area it is in the neighbourhood of the nettle clumps that this species is most numerous; it would appear, therefore, that the two species are not truly associated in this colony. Once again we find *H. arbustorum* present and here it seems to confine itself almost entirely to the nettle clumps.

THE WINNATS, CASTLETON.

On both sides of the Winnats a considerable number of *H. nemoralis* is found. This habitat is a wind swept gorge, the sides of which are scarred with limestone cliffs. The sides are covered with a short variety of grass and there appears to be little or no other vegetation present, with the exception of one or two small nettle clumps which are found on the upper reaches of the hillsides. In this colony the following varieties are found:—*libellula* 00000, *libellula* 00300, *libellula* 00000 *albolabiata*, *castanea* 00000, *castanea* 00300, *castanea* 00000 *albolabiata*, *rubella* '00000 and *rubella* 00000 *albolabiata*. *H. hortensis* is not found in this habitat, but *H. arbustorum* is found along the bottom of the hillside, while *H. lapicida* is to be found on the outcropping limestone.

SUMMARY AND CONCLUSION.

In the case of *H. hortensis* no appreciable fluctuation in the size was noted from colony to colony and in all cases only band varieties of the type were found. *H. nemoralis*, however, varies considerably in size and banding and several interesting comparisons can be made. The shells from the colonies at Cavedale and Millers Dale are similar in size and marking, the bands being broad and deep in colour, but while only the third band is present on the Millers Dale shells the tendency at Cavedale is for the full complement to be present. Also the shells from Deepdale and the Winnats agree very closely in colour, size and banding; an exception, however, must be made in the case of the variety *libellula* 00000 *albolabiata* which is as small as a small *H. hortensis* in the Winnats, while in Deepdale practically all the shells examined were above the average size generally attained by *H. nemoralis* in this locality. Only in two colonies can the two species be said to be truly associated; in all the other colonies either only one species is found or there is a clear line of demarcation between the two species, and it is generally found that *H. hortensis* prefers situations that are shaded and slightly damp, while *H. nemoralis* is to be found in drier and generally open situations.

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PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND.

508th Meeting, held at the Manchester Museum, February 1st, 1922.

Mr. R. Standen in the chair.

Candidate Proposed for Membership.

Colonel E. C. Freeman, M.D., Angel Corner, Bury St. Edmunds (introduced by Col. A. J. Peile and J. R. le B. Tomlin, M.A.).

Resignation.

C. P. Jenkinson.

Members Deceased.

T. S. Hillman. J. S. Gladstone.

Paper Read.

"Notes on the Nomenclature of *Hygromia*, *Helicella*, etc.," by Hugh Watson, M.A.

Principal Exhibits.

By Mrs. Gill: Species of *Pterocera*, including growth stages.

By Mr. W. H. Davies: *H. nemoralis* (15 mm. diam.) from Deep Dale, near Buxton, for comparison with specimens (24 mm. diam.) from Baguley, Cheshire.

The Special Exhibit was British *Vertigo*.

509th Meeting, held at the Manchester Museum, March 1st, 1922.

Mr. G. C. Spence in the chair.

New Member Elected.

Colonel E. C. Freeman, M.D.

Candidate Proposed for Membership.

H. de W. Marriott, 15, Northenden Road, Sale, Cheshire (introduced by A. K. Lawson and J. W. Jackson).

Paper Read.

"The Significance of Dominant Euadeniates in Africa," by John W. Taylor, M.Sc.

Principal Exhibits.

By the Rev. L. W. Grensted: *Paludestrina jenkinsi* (smooth and carinate) from drain leading from reservoir at Levenshulme, Manchester (February, 1922).

By Mr. W. H. Heathcote: Large series of freshwater species from Hutton Marsh, near Preston, associated with brackish-water crustacea, etc.

The Special Exhibit was "British *Pupilla*."

510th Meeting, held at the Manchester Museum, April 8th, 1922.

Mr. G. C. Spence in the chair.

New Member Elected.

H. de W. Marriott.

Members Deceased.

R. M. Lightfoot. Rev. E. A. Woodruffe-Peacock.

Papers Read.

"The Helicoid group *Callina* Lowe, with description of a New Species," by Prof. T. D. A. Cockerell.

"Three Cephalopods new to Dorset," by T. E. Belcher.

"*Crepidula fornicata* in Dorset," by T. E. Belcher.

Exhibits.

By Mr. H. Coates:—*Paludestrina jenkinsi*, *Pisidium casertanum*, and *P. subtruncatum*, taken from bill of a scaup duck *(Nyroca marila)* shot in the Old Harbour, Perth (Perth Mid.), on Feb. 15th, 1922. Some of the shells were adhering to the outside of the bill; others were entangled in the lamellæ, and illustrate a probable means of transport and dispersal of small molluscs.

By Mr. R. Standen:—*Opeas gracile* Hutton, and *Leucocheiloides coenopictus* Hutton, from Khartum (coll. R. Cottam, Sept. 1921).

By Mr. J. W. Jackson:—*Milax sowerbyi* var. *nigrescens* and *Agriolimax agrestis* var. *reticulata*, from a garden at Withington, Manchester (coll. J. Watson, April 1922); large *Ensis ensis* (length, 22 c.m.) from Little Haven, Pembrokeshire.

By Mr. E. Crapper:—*L. pereger* from Kinfauns, Perth, and R. Esk, Langholm, Dumfries; *A fluviatilis*, from Glencarse, Perth; *Pisidium casertanum*, from Dighty Water, Dundee, and Laird's Loch, Forfarshire; also *P. nitidum*, from Huntly Burn, Perth.

By the Rev. L. W. Grensted:—*Vallonia costata*, from Hall Road, S. Lancs.; *Paludestrina jenkinsi* (carinate and non-carinate), from the neighbourhood of R. Alt, Hightown, S. Lancs. Some interesting remarks were made on tidal influences and carination.

511th Meeting, held at the Manchester Museum, May 6th, 1922.

Mr. G. C. Spence in the chair.

Member Deceased.

G. H. Taylor.

Sympathetic reference was also made to the recent death of a former member, J. Kidson Taylor.

Papers Read.

"On the Association and Non-Association of *Helix nemoralis* Linné and *Helix hortensis* Müller," by W. Cartwright, M.Sc., O.B.E.

"Some uses of Shells in the Belgian Congo," by F. M. Dyke.

Exhibits.

By Mr. F. M. Dyke: *Olivella mutica* and *Cypræa moneta* to illustrate his note.

By Mr. J. W. Jackson: *Cypræa annulus* used in the markets of Ibadan, West Africa; also *Cypræa annulus* and pot imitations from tomb in Middle Egypt (800-300 B.C.).

By Mr. R. Standen: Eggs of *Cypræa caputserpentis* from Funafuti.

LAND AND FRESHWATER MOLLUSCA OF WINSLEY IN NORTH WILTS.

BY DOUGLAS BACCHUS.

(Read before the Society, September 8th, 1920).

THE village of Winsley lies some five miles east of Bath and two miles west of Bradford-on-Avon, about one-and-a-half miles inside the North Wilts. border and about half-a-mile north of the Kennet and Avon Canal. Some 520 feet above sea level, it is situated at the top of a hill which rises at Limpley Stoke and descends again to Bradford-on-Avon.

The formation on which the village stands is Bath Oolite. Having to spend three months this spring at Winsley Sanatorium and not being able to walk very far, it has amused me to see how many species of Land and Freshwater mollusca I could find within a ten minutes' walk of the place. The Sanatorium, two hundred yards west of the village, stands on what some hundred years ago was a large stone quarry. The grounds are about 55 acres in extent, ten acres of which are woodland, consisting of beech and larch with a sprinkling of horse-chestnut, as well as hazel and the usual undergrowth. I do not think there is, however, a single holly tree.

The Canal is 300 feet below the Sanatorium. The freshwater shells were taken from 100 yards of this. The fields round the district are divided one from the other by stone walls of the local stone built without cement. Under the loose stones at the top of these walls was always a good collecting ground for the stone-loving species. The woods mentioned below are those in the Sanatorium grounds.

Exclusive of *Pisidium* (except *P. amnicum*) the recorded land and freshwater shells for N. Wilts. were 91. I managed to add three new ones and confirmed one, making a total of 94. My total for the district is 68, which is not so bad considering the small space searched. The whole of the ground covered was searched in three weeks (March 1—21). Records bearing a date were taken later.

In a small stream between the Canal (the N. and S. Wilts. dividing line) and the river Avon, which is the dividing line between Wilts. and Somerset, I found numerous examples of *Paludestrina jenkinsi.* Twenty yards north would have placed them in North Wilts.; twenty yards west and they would have been Somerset examples.

Testacella maugei.—One specimen feeding on *H. aspersa.* Sanatorium Garden, April 10th. Very large. New record for Wilts. N. and kindly identified by Mr. J. W. Taylor.

Limax maximus.—Quarry; woodlands; not common. The shell of one specimen measured L. 13 mm., B. 7 mm. and 1 mm. thick, which I believe is unusual. The shell was quite heavy for its size.

L. arborum.—Under dead leaves at foot of beech trees, also on trunks; April and May.

Agriolimax agrestis.—Common in grounds.

Milax sowerbyi.—One immature, taken under beech leaves March 14th, another taken about a month later. First record for Wilts. N.

Vitrina pellucida.—Fairly common; grounds.

Hyalinia crystallina.—Very common in woods, under stones and dead leaves.

H. cellaria and var. **albina.**—Common under stones; woods.

H. alliaria.—Common; woods.

H. nitidula.—Common: woods; under stones.

H. pura.—Not common; woods; under stones.

Arion ater.—Type (all black), common; especially in larch plantation.

var. **rufa.**—Chocolate brown, common; more often found under dead beech leaves.

A. minimus.—Common; woods under beech leaves.

A. hortensis.—Common; gardens.

Punctum pygmæum.—Two under dead leaves in woods.

Pyramidula rupestris.—Swarming in thousands under loose stones on walls.

P. rotundata.—Common everywhere.

Helicella virgata.—Common; grounds especially; banks on roadsides, also on walls. Type and vars. *depressa*, *nigrescens*, *albicans*, and *lutescens* (yellow markings turning to purple at mouth, and of a large size).

H. itala.—None seen except two dead shells till April 21st; then swarming in new apple orchard in Sanatorium and on a bank at Turleigh.

Type and var. **alba.**

H. caperata.—Common: fields; hedgerows; walls.

Type and vars. **ornata, fulva, subscalaris.**

Hygromia fusca.—Under dead leaves in woods, not common.

H. hispida.—Common everywhere.

Type (reddish and horn-coloured) and vars. **nana** and **depilata**. The majority of the mature shells seen were hairless.

H. striolata.—Common everywhere. Banks, roadsides on nettles, in grounds and on walls.

var. **alba**. Nearly as common as type; more so on walls, also very depressed varieties of same.

var. **albocincta**. Fairly common.

Acanthinula aculeata.—Common under fallen beech leaves in grounds; occasionally on walls, but such specimens are much worn.

Vallonia pulchella.—Fairly rare; in a few places with *V. costata.*

V. costata.—Common under stones on walls, especially when ivy-covered; in one or two places in village and on Bradford Road.

Helicigona lapicida.—On quarry facings in one or two places. Two specimens found at base of sycamore tree (*A. pseudo-platanus*) have a bronze kind of periostracum.

H. arbustorum.—Banks by canal; also vars. *fuscescens* and *flavescens* (March 26th).

Helix aspersa.—Common everywhere. Nearly all specimens are very light in colour, more nearly approaching var. *zonata.*

vars. **zonata, flammea, unicolor** (one; lane leading to canal from Sanatorium).

Aspersa reaches here a large size, but small examples are not rare (alt. 27 mm., diam. max. 28 mm., min. 23 mm.).

This snail was a great dish with many of the villagers.

H. nemoralis.—Very common in grounds. Of the first hundred gathered I give the following list:—Type 12345, 10; type (12345), 8; type 123(45), 23; type (12)3(45), 5; type 00345, 4; var. *castanea*, 23; var. *rubella*, 00300, 12; var. *rubella*, 00000, 6; var. *libellula*, 00300, 5; var. *libellula*, 00345, 3; *albolabiata* and *rubella*, 1.

H. hortensis.—Rarer than *nemoralis* in grounds, but commoner along canal banks.

Type, 12345, 00345, (12345), 10005.

var. **lutea**, 00000. Common.

var. **incarnata**, 00000. Rare.

Ena obscura.—Common in grounds, hedgerows, etc.

Cochlicopa lubrica.—Common under beech trees in grounds.

var. **hyalina**.

Cæcilioides acicula.—Two dead shells under moss in grounds.

Pupilla muscorum.—Common in colonies on walls; Bradford Road, near front entrance to Sanatorium. I counted over 125 full-grown shells in the space of about three yards under loose stones on top of wall.

P. cylindracea.—In colonies on walls, Bradford Road and in village; slightly commoner than *marginata*. The majority of specimens approach var. *curta* in form. First record for Wilts. N.

P. secale.—On base of walls between lower entrance to Sanatorium and Conkwell Road on Winsley Hill (May 15th).

Sphyradium edentulum.—One, grounds under fallen leaves. (April 25th).

Balea perversa.—Two under stones on a wall half-way between Bradford-on-Avon and Winsley.

Clausilia laminata.—Common in grounds on and at foot of beech trees.

var. **albina.**—Nearly as common as type.

C. bidentata.—Very common everywhere, grounds, on walls, etc.

vars. **gracilior, tumidula, parvula, everetti.** At Turleigh forms almost the size of *C. rolphii* were taken.

Succinea putris.—Canal bank.

S. elegans.—Canal bank.

Carychium minimum.—Common under damp beech leaves in woods.

Pomatias elegans.—Very common and large; woods, hedgerows. Colour of shells varied from yellow to purple.

The following freshwater shells were taken in about 100 yards of the Kennet and Avon Canal at the foot of the Sanatorium grounds:—

Limnæa auricularia.—Common; one specimen 24 mm. × 30 mm.

L. pereger.—Common.

L. palustris.—One specimen only.

L. truncatula.—Common.

L. stagnalis.—Common.

Planorbis corneus.—One specimen only.

P. carinatus.—(April 3rd).

P. complanatus. P. spirorbis. P. vortex.

Physa fontinalis.—(March 30th). **Bithynia tentaculata.**

Vivipara vivipara.—Common, some reaching a large size.

Neritina fluviatilis.—Two specimens only.

Dreissena polymorpha.—Common.

Unio pictorum.—Common, but not large.

U. tumidus.—Two or three dead shells.

Anodonta cygnea.—Common. Some large.

A. anatina.—Common. **Sphærium rivicola.**—Common.

S. corneum. S. lacustre. Pisidium amnicum.

PALUDESTRINA CONFUSA (FRAUENFELD) IN THE WAVENEY VALLEY.

By C. OLDHAM.

(Read before the Society, September 7th, 1921).

It is some 18 years since Mr. Tomlin announced the discovery in the flood-débris at Oulton Broad, near Lowestoft, of dead shells of a small pectinibranch mollusc which the late Dr. Boettger referred with some hesitation to *Pseudamnicola anatina* (Drap.), a species doubtfully separable in his opinion from *P. similis* (Drap.). Mr. Tomlin tells me that although at the time he thought the Oulton shell differed from the one that used to occur in the marshes of the Thames between Woolwich and Greenwich, and which Jeffreys identified with Draparnaud's *Cyclostoma simile*, he now regards the two as local varieties, i.e. of *Amnicola confusa* of Frauenfeld.

So far as I know Oulton Broad is still the only recorded East Anglian station for *P. confusa*, but my experience of it in the Waveney Valley, last May, suggests that it will be found in the brackish tidal waters of other sluggish rivers between the Wash and the Thames. The reed-beds at Oulton are sometimes flooded by brackish water, but at the time of my visit they were dry except for a little water in holes and shallow trenches, and there I found *P. confusa* living with *Limnæa pereger*, *L. truncatula*, *Planorbis marginatus*, *P. leucostoma*, *Bithynia tentaculata* and *Paludestrina jenkinsi*, and—on the reed-stems just above water—*Hygromia hispida* and *Succinea putris*. *P. confusa* occurs not only in these reed-beds but in the Waveney, which is connected with the broad by a wide gut; and although I failed to find it in the marsh drains it was abundant at the muddy margin of the stream, in wet places between the retaining banks and the actual channel, and as dead shells, in the flood-débris. The land within the retaining banks is under water when the river is in flood or there is an unusually high tide, and as the distance from the sea increases the diminishing salinity of the water is apparent in the changes of the vegetation and in the associated mollusca. At a spot just below the swing-bridge which carries the Great Eastern Railway across the river near Beccles, the flood water, although brackish, is less so than at Oulton Broad; the plant-association indeed suggested a fresh-water marsh, its chief constituents being *Arundo phragmites*, *Iris pseudacorus*, *Thalictrum flavum*, *Spiræa ulmaria*, *Caltha palustris*, *Menyanthes trifoliata*, *Cardamine pratensis*, *C. amara*, and *Valeriana officinalis*. Here *P. confusa* was living with *Limnæa pereger*, *L.*

palustris, *L. truncatula*, *Succinea elegans*, *Paludestrina ienkinsi*, and *Pisidium personatum*. The presence of the *Pisidium* suggested a lower salinity than in the reed-bed at Oulton Broad.

At Barsham, two-and-a-half miles above Beccles and twenty-seven miles above Yarmouth, a lock stops the influence of the tide upon the sluggish river. The rise and fall are a matter of inches and, except perhaps when a high spring-tide coincides with a strong north-east wind, the water is perfectly fresh. At the water's edge, a little below the lock, snails were abundant, crawling on the wet mud or hiding beneath the stranded mats of green algæ. The species associated with *P. confusa* here were *Agriolimax agrestis*, *A lævis*, *Vitrea crystallina*, *Zonitoides nitidus*, *Euconulus fulvus*, *Arion ater*, *Hygromia hispida*, *Helicigona arbustorum*, *Succinea elegans*, *Carychium minimum*, *Limnæa pereger*, *L. truncatula*, *Paludestrina jenkinsi*, and *Pisidium personatum*.

◆

EDITORIAL NOTES.

THE following letter explains itself. It would be a calamity if the Zoological Record ceased to appear and anyone who can should urge its introduction into Libraries of all kinds.

ZOOLOGICAL SOCIETY OF LONDON,
REGENT'S PARK,
LONDON, N.W. 8, *17th January, 1922.*

The Editor of the *Journal of Conchology.*

Dear Sir,

I should be glad if you would draw the attention of your readers to the present position of the *Zoological Record.*

Owing to the collapse of the International Catalogue of Scientific Literature, in connection with which the Record was published from 1906 to 1914, the Zoological Society of London has undertaken to bear the whole financial responsibility for the preparation and printing of the Record.

Owing to the great increase of the cost of printing and to the very meagre support accorded to the Record by Zoologists and Zoological Institutes generally, the financial burden of this undertaking on the Zoological Society is becoming very severe. The cost of printing the Record now amounts to between £1,500 and £2,000 annually, and the Society receives back by subscriptions and sales less than 25% of this sum; I fear, therefore, unless Zoologists are prepared to make greater efforts to support the undertaking, there is a strong possibility that the Council of the Zoological Society may refuse to find this large sum each year.

It appears, therefore, to be the duty of every Zoologist to help so far as he is able to support this most invaluable work. All particulars and forms of subscription can be obtained from the Secretary of the Zoological Society, Regent's Park, N.W. 8, but I may mention that the price of the whole volume is now £2/10/0 and the price of the separate parts a proportional smaller sum; that of the portion Mollusca is 5/.

Yours faithfully,
W. L. SCLATER,
Editor *Zoological Record.*

Mr. Jackson has an excellent paper in the Lancashire and Cheshire Naturalist, vol. xiv, p. 147, on the Mollusca obtained from Tufaceous deposits at Caerwys, Flintshire. About 43 species were obtained, eight of these being so far unknown in the county in a living state. The list of species is accompanied by most useful critical notes, and the probable history of the Tufa is lucidly worked out.

Mrs. Longstaff published in the P.Z.S. 1921, p. 379 a series of observations on the habits of certain South African Achatinas in confinement. The observations covered a period of several years and were made upon *Cochlitoma zebra* var. *fulgurata* Pfr. and var. *obesa* Pfr. Both these forms were found to be at the same time ovoviviparous and oviparous.

The Quarterly Journal of Microscopical Science, vol. lxvi, pp. 159–185 contains Mr. G. C. Robson's exhaustive monograph "On the Anatomy and affinities of *Paludestrina ventrosa* Montagu." This is another of Mr. Robson's contributions to our knowledge of the Paludestrinidæ, a group which he characterises as peculiarly interesting, owing to the tendency to transition from a marine to a freshwater habit. *P. ventrosa* is stated to be a more definitely brackish-water form than *P. ulvæ*, but seems to possess a greater adaptability and tolerance.

Dr. A. Wagner: *Die Familie der Clausiliiden:* Rossmässler's Iconographie, Band xxi, Neue Folge 1913, Lieferung 1. 2.

Idem: *Zur Anatomie und Systematik der Clausiliiden*: Nachrichtsbl. deutsch. Malak. Gesellschaft, vol. 51, 1919, pp. 49–60, 87–104, 129–147.

In these treatises the author proposes a new system of classification for certain groups (mainly European) of Clausilia, based not merely upon the shell, as previous systems have been, but upon shell, radula, and certain soft parts of the animal. A satisfactory clue to classification will never be found in any single organ; a comparison and combination of several organs will lead to better results. It is remarkable how successful these classifications arrived at by the older school of conchologists (Küster, A. Schmidt, v. Vest, O. Boettger) have been, based as they were on the shell alone. But it has now been established that the whole apparatus for closing the shell in Clausilia (clausilium, plicæ, lamellæ, etc.) varies in development with the altitude of the habitat, in other words, with the greater or less amount of moisture in the air. Contiguity to the relatively moist air of the sea-board produces similar results. The elaborate devices of Clausilia for closing the mouth of the shell are not primarily a series of defences erected against the attacks of invaders (beetles, flies, etc.), but a means of retaining moisture, the loss of which is threatened, in this group especially, by the tenuity of the animal, consequent upon the prolongation of the shell. Transition forms, connecting more rudimentary with more elaborate "Schliessapparaten," may be traced between mountain and valley specimens of identical species, and the same is true of the *Medora* group in Dalmatia, and the *Albinaria* in the Greek islands. A further moisture-retaining device is found in the characteristic blue, blue-grey, or milk-white outer layer in the shells of certain groups (*Alopia*, *Albinaria*, *Agathylla*, etc.).

The most effective method of closure, and the most highly developed, is not that which is shown in the multiplication of plicæ, lamellæ and lunule, but in the complete blocking of the mouth by a clausilium, which reduces the evaporation of moisture to a minimum, and, working as it does on a sort of elastic strap, answers in fact to an operculum. From the systematic standpoint the clausilium is of little value; its size, shape, and development may vary even within the limits of individual species.

These considerations, which amount to an adoption and extension of the views long ago put forward by W. v. Vest (Verh. Siebenb. Ver. Naturw, xviii, 1867, pp. 5–18) in reference to the presence or absence of a clausilium in *Alopia*, tend to weaken a system of classification based on the shell alone. Radula investigation discloses the fact that two main groups occur, according as the central tooth is unicuspid or tricuspid.

The genital organs are that part of the animal which afford the best evidence for classification. They are more readily examined and preserved than other parts, and so yield the best results in the shortest amount of time. The comparative relations of the sexual organs (penis, vas deferens, and to a lesser extent the receptaculum seminis, the retractor muscles, and the diverticula) furnish never-failing and weighty evidence for the establishment of kindred forms and groups.

The system of classification proposed in the Nachrichtsblatt is somewhat modified from that of the Iconographie. Thus we have:

ICONOGRAPHIE.		NACHRICHTSBLATT.	
Genus	*Alopia* H. & A. Ad. (extended)	Genus	*Alopia* ex. rect. mea
Subg.	*Alopia* s. str.	Subg.	*Alopia* H. & A. Ad. s. str.
,,	*Herilla* Bttg.	,,	*Herilla* Bttg.
,,	*Medora* Vest	Genus	*Albinaria* ex rect. mea
,,	*Agathylla* Vest	Subg.	*Medora* Vest
,,	*Albinaria* Vest	,,	*Agathylla* Vest
,,	*Cristataria* Vest	,,	*Albinaria* Vest, s. str.
Genus	*Serbica* Bttg.	,,	*Cristataria* Vest
,,	*Delima* Hartm (extended)	Genus	*Garnieria* Bgt.
Subg.	*Delima* s. str.	,,	*Delima* ex rect. mea
,,	*Siciliaria* Vest	Subg.	*Mauritanica* Bttg.
,,	*Carinigera* Mldff.	,,	*Siciliaria* Vest
		,,	*Carinigera* Mldff.
		,,	*Delima* Vest [? Hartm.] s. str.
		Genus	*Neoserbica* n.
		,,	*Triloba* Vest
		,,	*Papillifera* Vest [ex rect. mea]
		Subg.	*Papillifera* s. str.
		,,	*Isabellaria* Vest
		,,	*Leucostigma* n.

It will be for the systematist to say how far this extension or "rectification" of long established groups is in accordance with the laws of nomenclature. But in any case the work of Dr. Wagner, accompanied as it is in the Iconographie by many beautiful figures, is a valuable contribution to science.

A. H. C.

THE PISIDIA OF GUERNSEY AND SARK:

By J. R. le B. TOMLIN, M.A.

(Read before the Society, April 9th, 1919).

Messrs. Stelfox, Oldham and Phillips have kindly examined a number of gatherings of Pisidia from these two islands for me with the following results. Mr. Overton has been good enough to allow me to include several records of gatherings made by himself, which have been verified by the same three experts :—

Guernsey.

P. subtruncatum Malm.

Near Japanese House and King's Mills (Overton) ; Grand Mare, stream running into Perelle Bay, quarry at Portinfer, Vrangue mill-pond, Ivy Castle, and douit close to the Sports Ground.

P. personatum Malm.

King's Mills (Overton) ; stream in the Petit Bot valley, wet ground on the cliffs near the Corbière and above the Creux Mahie, cattle-trough at Pleinmont and the Vrangue mill-pond.

P. casertanum Woodward.

Petit Bot valley, cattle-trough at Pleinmont, cliffs near Pleinmont and near the Corbière, Grande Mare, Vrangue mill-pond, douit close to the Sports Ground and pool near Fort Doyle.

P. nitidum Jenyns.

Near Japanese House and King's Mills (Overton) ; stream running into Perelle Bay, waterhole on the cliffs near Pleinmont, Grande Mare, quarry pond at Portinfer ("some exceptionally large"—C. O.), Vrangue mill-pond, streams round Ivy Castle and douit near the Sports Ground.

P. obtusale Pfeiffer.

Streams round Ivy Castle, quarry pond at Mont Cuet, marshy ground near Fort Doyle.

P. milium Held.

Near Japanese House (Overton) ; Grande Mare, quarry on Lancresse Common ("narrow and elongated, young shells perhaps flatter than usual," A.W.S.), Vrangue mill-pond, streams round Ivy Castle.

Sark.

P. personatum Malm. (very fine shells," A.W.S.)

P. casertanum Woodward.

A batch taken in 1884 from the muddy, weedy pond which used to exist above the harbour, consists of these two species. All the shells from this pond were encrusted with a ferruginous deposit and were erroneously recorded as *P. roseum* (*J. of C.* i. 321) and as *P. pusillum* (*J. of. C.* iv. 271, x. 294). *P. personatum* occurred also in September, 1921, in a cattle-trough in gravelly mud, just below the Vicarage.

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